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DIE HENGELAAR SE GIDS TOT DIE GEELVISSE VAN TRANSVAAL

AN ANGLER'S GUIDE TO THE YELLOWFISHES OF THE TRANSVAAL

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DIE HENGELAAR SE GIDS TOT DIE GEELVISSE VAN TRANSVAAL

deur A. A. v. J. Groenewald

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INLEIDING.

Geelvisse is kenmerkend van die meeste Transvaalse waters. Die hengelaar kan altyd verwag om geelvis te vind, hetsy in die warm water van 'n afgesonderde kuil in die droë Limpopo, die helder, vinnig-vloeiende stroom van die Krokodil of die koue troebel waters van die Vaal. Hulle is nie alleen beroemd as sportvisse nie, maar ook vir hul aantreklike voorkoms en pragtige geel, brons of silwer kleur. Hul maksimum gewig varieer volgens die soort van 'n paar tot oor 30 pond. Ten spyte van hul gewildheid, het hengelaars dit nog altyd onmoontlik gevind om geelvisse uit te ken. Oppervlakkig lyk sommige van hulle so eenders dat dit onmoontlik is om hulle te onderskei sonder 'n taksonomiese sleutel. Selfs vir wetenskaplikes was dit met die bestaande literatuur onmoontlik. 'n Intensiewe studie van geelvistaksonomie het gevolglik nodig geword, nie alleen om die hengelaar in staat te stel om te weet wat hy vang nie, maar ook omdat wetenskaplikes wat die biologie van hierdie visse bestudeer, in staat moet wees om hulle akkuraat uit te ken. Die doel van hierdie werk was dus om 'n identifikasie-sleutel daar te stel, eenvoudig genoeg vir die leek om te gebruik maar tog betroubaar genoeg om die wetenskaplike te bevredig. Hierdie werk sal in 'n meer breedvoerige vorm in 'n wetenskaplike tydskrif gepubliseer word.

MATE GEBRUIK VIR IDENTIFIKASIE.

Om eenvormigheid van tegniek te verseker, volg hieronder 'n uiteensetting van die verskillende skubtellings en mate wat aangewend is om die Transvaalse geelvisse uit te ken. Die leser word ook na die diagram van 'n vis (fig. 2) verwys.

(1) Totale lengte: afstand van punt van snoet tot by die ent van die middelste strale van die stertvin.

(2) Liggaamslengte: afstand van punt van snoet tot by laaste skub op die stertstam.

(3) Koplengte: afstand van punt van snoet tot agterrand van kieudeksel.

(4) Snoetlengte: afstand van punt van snoet tot voorrand van oog.

(5) Inter-orbitaalwydte: afstand tussen oë.

(6) Post okulêre gedeelte van kop: afstand van agterrand van oog tot agterrand van kieudeksel.

(7) Mondwydte: distansie tussen mondhoeke.

(8) Lengte van stertstam: afstand van laaste vertakte straal van anaalvin tot laaste skub op stertstam.

AN ANGLER'S GUIDE TO THE YELLOWFISHES OF THE TRANSVAAL

by A. A. v. J. Groenewald

(Provincial Fisheries Institute, Lydenburg)

INTRODUCTION.

Yellowfishes are characteristic of most of the Transvaal waters. Whether it be in the warm water of an isolated pool in the dry Limpopo, the clear swift-flowing stream of the Crocodile or the cold turbid waters of the Vaal, the angler may expect to find yellowfish. They are not only famous as sporting fishes but also for their attractive shape and lovely yellow, bronze or silvery colour. Their maximum weight varies according to the species from a few to well over 30 pounds. In spite of their popularity the yellowfishes have always defied identification by the angler. Superficially some of them are so alike that it is quite impossible to identify them without a taxonomic key. Even scientists find it impossible with the existing literature. Therefore an intensive study of yellowfish taxonomy became necessary not only to enable the angler to know what he is catching, but also because scientists who study the natural history of these fishes must be able to identify them accurately. The aim of this work was thus to draw up an identification key simple enough for the layman to use and yet reliable enough to satisfy the scientist. This work will also be published in a more extensive form in a scientific journal.

MEASUREMENTS USED FOR IDENTIFICATION.

To ensure uniformity of technique an explanation is given below of the different scale counts and measurements used in identifying Transvaal yellowfish. The reader is also referred to the diagram of a fish (Fig. 2).

(1) Total length: distance from tip of snout to the end of the middle rays of the tail-fin.

(2) Body-length: distance from tip of snout to the hind margin of the last caudal peduncle scales.

(3) Head-length: distance from tip of snout to the hind margin of the gill-cover.

(4) Snout-length: distance from tip of snout to the front rim of eye.

(5) Inter-orbital width: distance between eyes.

(6) Post-ocular part of head: distance from hind rim of eye to the hind margin of the gill-cover.

(7) Mouth-width: distance between corners of mouth.

(8) Length of caudal peduncle: distance from last anal ray to end of scales on caudal peduncle.

(9) Depth of caudal peduncle: smallest depth.

(10) Number of lateral line scales: this count is made along the lateral line from the gill-cover to the tail-fin.

(9) Diepte van stertstam: kleinste diepte.

(10) Getal sylynskubbe: hierdie telling word al met die sylyn gemaak van die kieudeksel tot by die stertvin.

(11) Getal skubbe tussen sylyn en die middel van rug: hierdie telling word van net voor die basis van die eerste rugvinstekel regaf na die sylyn gemaak en sluit nie die skub in die middel van die rug of die betrokke sylynskub in nie.

(12) Getal skubbe tussen sylyn en middel van buik: hierdie telling word regaf voor die buikvinne gemaak. Die betrokke sylynskub sowel as die skub in die middel van die buik word nie by hierdie telling ingesluit nie.

(13) Getal skubbe om die stertstam: hierdie telling word rondom die middel van die stertstam gemaak.

(14) Getal kieusifgrate op die boonste en onderste helftes van die eerste kieuboog: slegs die sifgrate in die buitenste ry word getel.

(15) Getal strale in rugvin: daar is altyd 4 stekels of onverdikte, eenvoudige strale en 'n aantal vertakte strale (7–10). Die laaste vertakte straal is vertak tot aan sy basis en hierdie twee helftes moet nie as afsonderlike vertakte strale getel word nie. Die formule vir die rugvin word dus as volg geskryf: iv 7. Die Romeinse syfers dui die getal stekels aan en die Arabiese syfers die getal vertakte strale. Die eerste stekel is gewoonlik kort en dikwels nie oppervlakkig sigbaar nie.

PRESERVERING VAN VISEKSEMPLARE.

Die hengelaar wil dikwels 'n snaakse of onbekende vis preserveer vir uitkenning. Brandspiritus word algemeen vir hierdie doel gebruik, maar ontwatering en gevolglike krimping van eksemplare maak dit onbevredigend as 'n bewaringsvloeistof. Formalien, algemeen verkrygbaar by apteke, is 'n goeie en goedkoop bewaringsvloeistof en word vir gebruik aangemaak deur 5 dele skoon water by een deel kommersiële (40%) formalien te voeg. 'n Kort sny moet in die buik van visse langer as 10 duim gemaak word om te verseker dat die bewaarmiddel indring.

DIE RIVIERSISTEME.

Transvaal word deur vier riviersisteme gedreineer. Suidelike Transvaal word gedreineer deur die Vaalrivier wat 'n deel van die Oranjesisteem vorm en in die Atlantiese Oseaan uitmond. Die suidelike gedeelte van die oostelike platorand van die Natalse grens tot by Carolina word gedreineer deur die Usutusisteem. Hierdie sisteem bestaan uit die Pongola-, Assegaai-, Ishlelo-, Ingwempisi-, Usutu- en Umpilusiriviere met hul takstrome. Die platorand van Carolina tot 'n punt noord van Graskop, sowel as die Oos-Transvaalse Laeveld word gedreineer deur die Inkomatisisteem wat bestaan uit die Komati-, Krokodil- en Sabieriviere. Die Limpopo dreineer die Noordwestelike, Sentrale en Noordoostelike Transvaal (sien fig. 1). Omdat hierdie stroomgebiede ook Swaziland en Suidelike Mosambiek dek, is versamelings van visse ook in hierdie gebiede gemaak om sodoende die hele geografiese area wat deur die opvanggebiede van die oos-vloeiende riviere behels word, in te sluit.

(11) Number of scales between lateral line and middle of back: this count is made vertically downwards immediately in front of the first dorsal spine and it does not include the scale in the middle of the back or the particular lateral line scale.

(12) Number of scales between lateral line and middle of belly: this count is made vertically downwards in front of the pelvic fins. The particular lateral line scale and the scale in the middle of the belly is not included in this count.

(13) Number of caudal peduncle scales: this count is made round the middle of the caudal peduncle.

(14) Number of gill-rakers on the upper and lower half of the first gill-arch: only the gill-rakers in the outer row are counted.

(15) Number of rays in the dorsal fin: there are always 4 spines or soft simple rays and a number of branched rays (7–10). The last branched ray is branched down to its base and care should be taken not to count these halves as two separate branched rays. The formula for the dorsal fin is written thus: iv. 7, the Roman numerals indicating the number of spines and the Arabic numerals indicating the number of soft branched rays. The first dorsal spine is usually very short and not often visible.

PRESERVATION OF FISH SPECIMENS.

The angler often wants to preserve a strange or unknown fish for identification. Methylated spirits is commonly used for this purpose, but dehydration and consequent shrinkage of specimens make spirits unsatisfactory as a preservative fluid. Formalin is a good and inexpensive preservative which is readily available from chemists, and is made up for use by adding five parts of clean water to one part of commercial (40%) formalin. To facilitate penetration of the preservative a small slit should be cut in the belly of a fish longer than 10 inches.

THE RIVER SYSTEMS.

The Transvaal is drained by four river systems. The Southern Transvaal is drained by the Vaal River which is a part of the Orange system and spills into the Atlantic Ocean. The southern part of the Eastern escarpment from the Natal border up to Carolina is drained by the Usutu system. This system consists of the Pongola, Assegaai, Ishlelo, Ingwempisi, Usutu and Umpilusi rivers with their tributaries. The escarpment from Carolina to a point North of Graskop, as well as the Eastern Transvaal Lowveld is drained by the Incomati system consisting of the Komati, Crocodile and Sabie rivers. The Limpopo drains the North-western, Central and North-eastern Transvaal (see Fig. 1). Because these river basins also cover Swaziland and Southern Mocambique, extensive collections of fishes were also made in these territories in order to cover the whole geographical area embraced by the basins of the east-flowing rivers.

A knowledge of the river systems is of vital importance in identifying fishes, because closely allied species which inhabit different river systems are easily identified by referring to the river where they were caught. A case in point is *Barbus holubi*, the smallmouth yellowfish of the Vaal River, and *Barbus marequensis* of the east-flowing rivers which can hardly be distinguished by body characteristics.

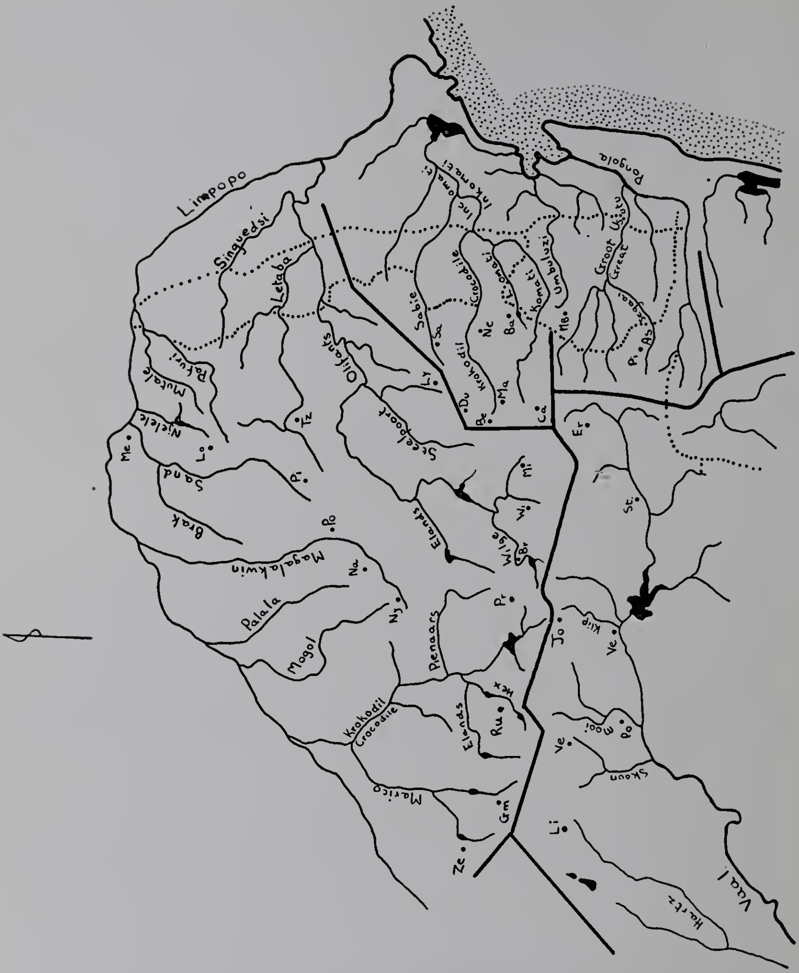

FIG. 1.—'n Kaart van Transvaal om opvanggebiede van riviere te toon.

FIG. 1.—A map of the Transvaal to show river basins.

'n Kennis van die riviersisteme is van groot belang om visse uit te ken omdat naverwante soorte wat verskillende riviersisteme bewoon, maklik uitgeken kan word deur te verwys na die rivier waarin hulle gevang is. 'n Voorbeeld is *Barbus holubi*, die kleinbek Vaalrivier-geelvis, en *Barbus marequensis* van die oos-vloeiende riviere wat nouliks op liggaamskenmerke geskei kan word.

Hul omgewing verander gedurig en geelvis, soos alle ander lewende diere, moet hulle by hierdie veranderinge aanpas of hulle sal uitsterf. Hul vaartbelynde liggame, die goed-ontwikkelde vinne sowel as die horingrif op die

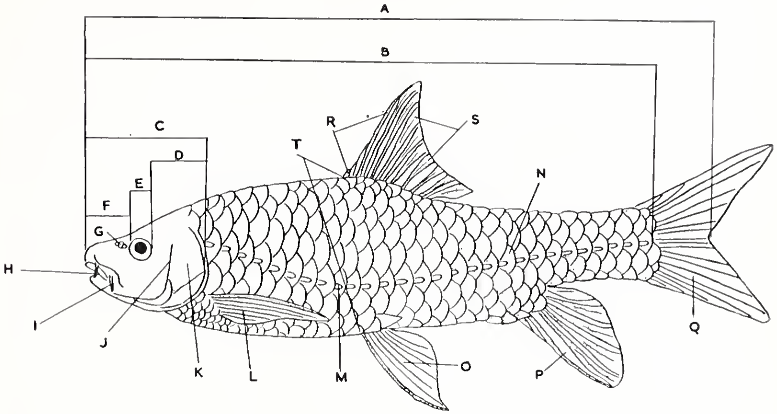

	Fig. 2.—Topography of a Yellowfish.		Fig. 2.—Topografie van 'n geelvis.
A.	Total length.	A.	Totale lengte.
B.	Body-length.	B.	Liggaamslengte.
C.	Head-length.	C.	Koplengte.
D.	Post-orbital length.	D.	Post-okulêre lengte.
E.	Eye-diameter.	E.	Oogdeursnit.
F.	Snout-length.	F.	Snoetlengte.
G.	Nostrils.	G.	Neusopening.
H.	Anterior barbel.	H.	Voorste voeler.
I.	Posterior barbel.	I.	Agterste voeler.
J.	Cheek-groove.	J.	Wanggroef.
K.	Gill-cover.	K.	Kieudeksel.
L.	Pectoral fin.	L.	Borsvin.
M.	Lateral line.	M.	Sylyn.
N.	Lateral line scale.	N.	Sylynskub.
O.	Pelvic fin.	O.	Buikvin.
P.	Anal fin.	P.	Anaalvin.
Q.	Caudal fin.	Q.	Stertvin.
R.	Simple rays.	R.	Onvertakte strale.
S.	Branched rays.	S.	Vertakte strale.
T.	Body-depth.	T.	Liggaamsdiepte.

Their environment is always changing and yellowfish, like all other living creatures, must adapt themselves to these changes or succumb. Its streamlined body, the well-developed fins, as well as the horny ridge on the lower jaw of some species, are good examples of this close relationship between form and environment in yellowfish. Changes develop gradually through many generations and they are manifested as variations in such characteristics as lip development, body proportions or scale-counts among the individuals of a particular species, and anglers should be careful not to regard an unusual specimen as a " new species ".

onderkaak van sommige soorte is goeie voorbeelde van hierdie noue verwantskap tussen vorm en omgewing by geelvisse. Veranderinge ontwikkel gedurende geslagte en word geopenbaar as variasies in lipontwikkeling, liggaamsverhoudings of skubtellings onder die individue van 'n bepaalde soort. Hengelaars moet versigtig wees om nie 'n snaakse eksemplaar as 'n „ nuwe soort " te beskou nie.

Geelvis behoort aan die twee genera *Barbus* en *Varicorhinus*. Die genus *Barbus* sluit egter ook 14 klein soortjies in wat nie langer as 4 duim tot 7 duim word nie. Hierdie groep, gesamentlik bekend as ghilliemientjies, word nie in hierdie artikel bespreek nie. Dit is moeilik om klein geelvissies van ghilliemientjies te onderskei, maar omdat hengelaars gewoonlik net geelvisse van wettige lengte (12 duim of groter) hanteer, is die onderskeiding tussen geelvisse en ghilliemientjies vir hulle van minder belang. Gelukkig het al die Transvaalse ghilliemientjies straalvormiggestreepte skubbe (sien fig. 3) terwyl al ons geelvisse met die uitsondering van die papierbek, *Barbus rapax*, oorlangsgestreepte skubbe het (fig. 4). In groot visse is hierdie *striae* sigbaar met die blote oog wanneer 'n skub teen die lig gehou word en in klein vissies kan dit deur 'n vergrootglas beskou word.

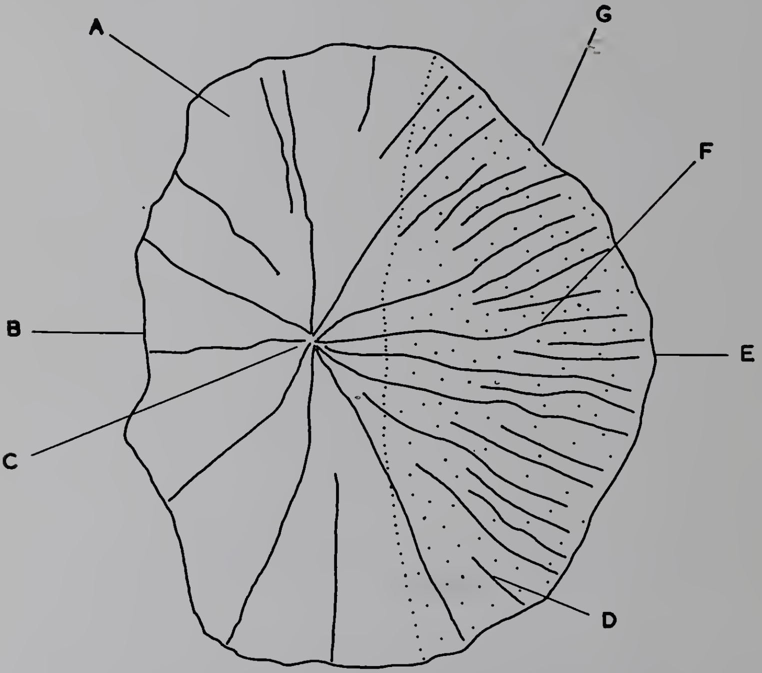

FIG. 3.—'n Straalvormig-gestreepte skub.
A. Gedeelte ingeplant in vel.
B. Voorrand.
C. Kern.
D. Sekondêre *striae*.
E. Agterrand.
F. *Striae*.
G. Vry gedeelte van skub.

FIG. 3.—A Radiately Striated Scale.
A. Embedded portion.
B. Anterior margin.
C. Focus.
D. Secondary *striae*.
E. Posterior margin.
F. *Striae*.
G. Exposed portion of scale.

Yellowfish belong to the two genera *Barbus* and *Varicorhinus*. The genus *Barbus*, however, also includes 14 small species which grow to a length of only four to seven inches. This group, collectively known as ghilliemientjies, is not considered in this report. Juvenile yellowfish are hard to distinguish from ghilliemientjies, but because anglers normally handle only legal-sized yellowfish of 12 inches and bigger the distinction between yellowfish and ghilliemientjies is of minor importance to them. Fortunately all Transvaal ghilliemientjies have radiately striated scales (see Fig. 3), while all our yellowfish with the exception of the Paper-mouth. *Barbus rapax*, have parallel-striped scales (see Fig. 4). In bigger fish these *striae* are visible with the naked eye when a scale is held against the light and in small fish it may be viewed through a hand lens.

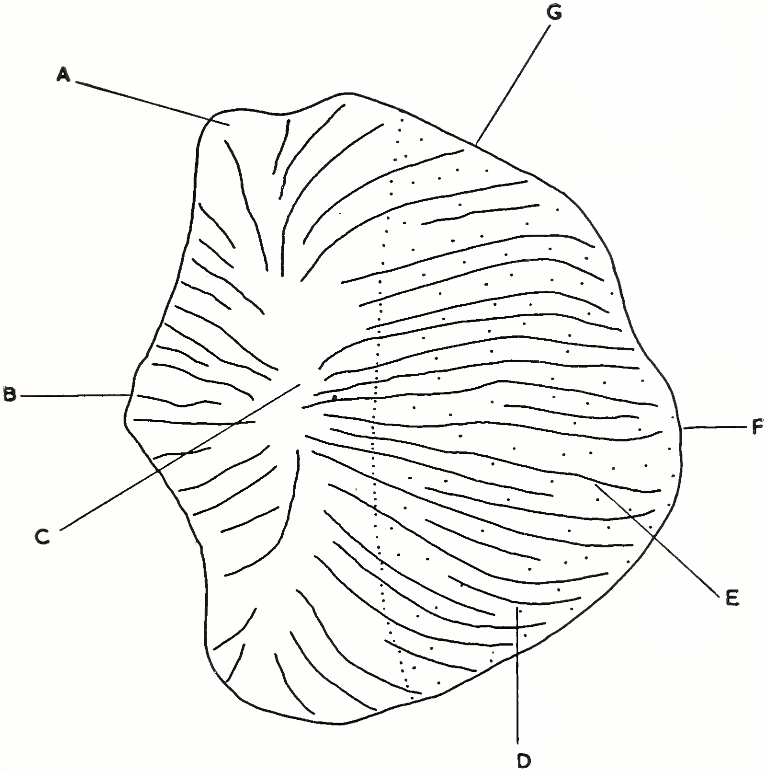

Fig. 4.—A Longitudinally Striated Scale.	Fig. 4.—'n Oorlangs-gestreepte skub.
A. Embedded portion.	A. Gedeelte ingeplant in vel.
B. Anterior margin.	B. Voorrand.
C. Focus.	C. Kern.
D. Secondary *striae*.	D. Sekondêre *striae*.
E. *Striae*.	E. *Striae*.
F. Hind Margin.	F. Agterrand.
G. Exposed portion.	G. Vry gedeelte.

In die bestaande werk oor die varswatervisse deur Gilchrist en Thompson (1913) word al die Transvaalse geelvis genoem. As gevolg van onvoldoende studie-materiaal wat destyds beskikbaar was, was die variasies in taksonomies-belangrike kenmerke nie bekend nie. Gevolglik is sekere soorte onder meer as een naam beskrywe. *Barbus brucii*, byvoorbeeld, was ook bekend as *B. sector*, *B. dwaarsensis*, *B. swierstrae*, *B. sabiensis* en *B. gunningi*. Deur baie eksemplare van hierdie soort van verskeie lokaliteite te bestudeer, is bewys dat hulle almal aan dieselfde soort behoort en dat wat voorheen as aparte soorte beskou was, net oorvleuelende variasies binne dieselfde soort is. Dit is bevestig deur die tipe-eksemplare waarop die oorspronklike beskrywings gebaseer was, te ondersoek. Volgens die internasionale reëls van soölogiese nomenklatuur moet die oudste naam in sulke gevalle behou en die ander as sinonieme verwerp word. Die gevolg is dat van 22 soorte wat deur Gilchrist en Thompson en deur Boulenger beskrywe is, net 7 nou as geldig beskou moet word.

'N SLEUTEL TOT DIE GEELVISSE VAN TRANSVAAL.

Met behulp van die volgende sleutel kan geelvis uitgeken word deur te let op sekere kenmerke wat vir die leek maklik herkenbaar is. Die leser word verwys na die breedvoerige beskrywings van die verskillende soorte om uitkennings te bevestig. Wanneer die sleutel gebruik word, is dit belangrik om op die verspreiding van verskillende soorte te let.

I.—Laaste stekel van rugvin getand (sien fig. 6), skubbe straalvormig-gestreep:

Barbus rapax (fig. 5).

Limpoposisteem.

II.—Laaste stekel van rugvin ongetand, skubbe oorlangsgestreep (sien fig. 4).

A. Onderkaak kort en breed met 'n skerp, horingagtige snyrif en geen lip (sien fig. 10, 14 en 15).

(1) 35–41 skubbe in die sylyn, voorste voelers afwesig:

Varicorhinus nelspruitensis (fig. 9).

Limpopo-, Inkomati- en Usutusisteme.

(2) 27–33 skubbe in sylyn, twee paar lang voelers:

Varicorhinus brucii (fig. 13).

Limpopo-, Inkomati- en Usutusisteme.

In the existing treatise on the freshwater fishes of South Africa by Gilchrist and Thompson (1913) all the Transvaal yellowfishes are mentioned. Due to inadequate study material available at that time, however, the great variations in the taxonomically important characteristics of yellowfishes were not known. Consequently certain species were described under more than one name. *Barbus brucii*, for example, was also known as *B. sector*, *B. dwaarsensis*, *B. swierstrae*, *B. sabiensis* and *B. gunningi*. By studying many specimens of this species from various localities it was proved that they all belong to one and the same species and that what were previously regarded as separate species are only overlapping variations within the same species. This was confirmed by examining the type specimens on which the original descriptions were based. According to the international rules of zoological nomenclature the oldest name must in such cases be retained and the others discarded as being synonymous. The result was that of 22 species described by Gilchrist and Thompson and by Boulenger only seven are now regarded as valid.

A KEY TO THE YELLOWFISHES OF THE TRANSVAAL.

With the aid of the following key. yellowfish may be identified by observing certain characteristics easily recognised by the layman. For confirmation of identifications the reader is referred to the detailed descriptions of the various species. When using the key it is important to note the distribution of the various species:—

I.—Last spine of dorsal fin serrated (see Fig. 6), scales radiately striated:

Barbus rapax (Fig. 5).

Limpopo system.

II.—Last spine of dorsal fin not serrated, scales longitudinally striated (see Fig. 4).

A. Lower jaw short and broad with a sharp, horny cutting edge and no lip (see Figs. 10, 14 and 15).

(1) 35–41 scales in the lateral line, front barbels absent:

Varicorhinus nelspruitensis (Fig. 9).

Limpopo, Incomati and Usutu systems.

(2) 27–33 scales in the lateral line, two pairs of well-developed barbels:

Varicorhinus brucii (Fig. 13).

Limpopo, Incomati and Usutu systems.

B. Onderkaak gerond, sonder horingagtige snyrif en met 'n lip (sien fig. 18, 19, 21, 23, 28 en 32).

(1) 27–33 skubbe in sylyn:

Barbus brucii (fig. 16).

Limpopo-, Inkomati- en Usutusisteme.

(2) 36–45 skubbe in die sylyn.

(*a*) Eerste stekel van die buikvin ontspring direk onder die voorste strale van die rugvin. Kom voor net in die Limpopo-, Inkomati- en Usutusisteme:

Barbus marequensis (fig. 22).

(*b*) Eerste stekel van die buikvin ontspring duidelik vóór die eerste stekel van die rugvin. Kom voor net in Vaalrivier.

(i) Afstand van die wanggroef tot oog gelyk aan of groter as die snoetlengte (sien fig. 31):

Barbus kimberleyensis (fig. 30).

(ii) Afstand van die wanggroef tot oog duidelik kleiner as die snoetlengte (sien fig. 27).

Barbus holubi (fig. 26).

BARBUS RAPAX (fig. 5).

SILVERVIS OF PAPIERBEK.

Hierdie soort kom net in die Limpoposisteem voor waar sy verspreiding blykbaar beperk is tot die area wat rofweg deur die Groot Marico–Middelburg–Pietersburg-driehoek ingesluit word. In hierdie area bewoon dit die troebel, staande water van poele in die Krokodil-, Sand- en Olifantsriviere sowel as groot besproeiingsdamme soos Hartbeespoort, Loskop, Buffelspoort en Marico Bosveld.

Barbus rapax is die enigste Transvaalse geelvissoort met 'n getande laaste stekel in die rugvin en straalvormige groefies op die vry oppervlakte van die skubbe (sien fig. 3) asook die enigste geelvis in die Limpoposisteem waarvan die buikvinne duidelik vóór die eerste rugvinstekel ontspring. Daar moet onthou word dat hierdie studie nie die ghilliemientjies wat almal straalvormige strepies of *striae* op die vry oppervlakte van die skubbe het, insluit nie.

Die groot, hooggeplaaste oë, die buitengewone klein aantal kieusifgrate, die swak-ontwikkelde voelers en groot, terminale mond dui daarop dat dit 'n roofvis is (sien fig. 7). Die monddele is vry-beweeglik en die kake kan soos dié van 'n swartbaars na vore uitgestoot word. Die dun, deurskynende

B. Lower jaw rounded, without horny cutting edge and with a lip (see Figs. 18, 19, 21, 23, 28 and 32).

(1) 27–33 scales in the lateral line:

Barbus brucii (Fig. 16).

Limpopo, Incomati and Usutu systems.

(2) 36–45 scales in the lateral line.

(*a*) The first spine of the pelvic fin originates directly below the front rays of the dorsal fin. Present only in Limpopo, Incomati and Usutu systems:

Barbus marequensis (Fig. 22).

(*b*) The first spine of the pelvic fin originates well in advance of the first spine of the dorsal fin. Present only in the Vaal River system.

(i) Distance from the cheek-groove to the eye equal to or larger than snout-length (see Fig. 31):

Barbus kimberleyensis (Fig. 30).

(ii) Distance from the cheek-groove to the eye clearly shorter than the snout-length (see Fig. 27):

Barbus holubi (Fig. 26).

BARBUS RAPAX (Fig. 5).
SILVERFISH OR PAPER-MOUTH.

This species occurs only in the Limpopo system where its distribution seems to be limited to the area roughly enclosed by the Groot Marico–Middelburg–Pietersburg triangle. In this area it inhabits the turbid standing water of pools in the Crocodile, Sand and Olifants rivers as well as large irrigation dams like Hartbeespoort, Loskop, Buffelspoort and Marico Bosveld.

Barbus rapax is the only Transvaal species of yellowfish with a serrated last dorsal spine as well as radiating *striae* on the free surface of the scales (see Fig. 3), and the only yellowfish from the Limpopo system which has the ventral fins originating clearly in advance of the first dorsal spine. It should be noted that this study does not include the minnows which all have radiating *striae* on the exposed surface of the scales.

The large, highly placed eyes, the exceptionally small number of gill-rakers, the feebly developed barbels and large terminal mouth indicate a carnivorous way of feeding (see Fig. 7). The mouth-parts are highly movable and the jaws are protractile like those of a black bass. The thin transparent membrane lying between the jaws when the mouth is opened wide caused

membraan wat tussen die kake lê wanneer die mond wyd oopgemaak word, het aan hierdie soort die naam „ papierbek " besorg hoewel die vis as gevolg van sy kleur in troebel water ook as „ silwervis " bekend is. In helder, lopende water is die algemene liggaamskleur 'n ligte olyfgroen en die stert- en anaalvin is oranjekleurig. Die hoë skof en lang onderkaak, wat voor die bokaak uitstaan, is ewe tipies van die soort.

Die lippe is dun en daar is geen ken-lob op die ken nie (sien fig. 8). Die agterste paar voelers is altyd teenwoordig en hul lengte is amper gelyk aan die oogdeursnit. Die voorste voelers is swak-ontwikkel en een of altwee mag afwesig wees (sien fig. 7). Daar is 4 stekels en 8 vertakte strale in die rugvin. Die laaste stekel is verdik en getand, maar sy punt is sag en buigbaar (sien fig. 6). Daar is 29 tot 35 skubbe in die sylyn en 14 rondom die stertstam.

Hierdie vis is nie baie gewild onder hengelaars nie omdat dit selde 'n gewig van meer as 2 pond bereik. In Hartbeespoort- en Loskopdam word hulle dikwels gevang terwyl na kurper of karp gehengel word. Hulle byt geredelik aan 'n kunsvlieg wanneer hulle aan die oppervlakte kos soek.

VARICORHINUS NELSPRUITENSIS (fig. 9).

KLEINSKUB HORINGBEK-GEELVIS.

Die twee soorte *Varicorhinus* is tipiese geelvisse in voorkoms en gewoontes, maar die buitengewoon wye, vierkantige onderkaak met sy goed-ontwikkelde spiere aan die binnekant van die kaak en skerp, horingagtige snyrif onderskei hulle van al die ander soorte Transvaalse geelvis (sien fig. 10).

Die breë, betreklik kort kop van *V. nelspruitensis* met sy konvekse bo-profiel en wye mond het 'n papegaaiagtige voorkoms (sien fig. 11). Die oë is klein en sit diep in die kop. Die lippe is dun, die onder-oppervlakte van die kaak is glad en daar is geen ken-lob. Die rand van die onderkaak is feitlik reguit en voorsien van 'n horingagtige snyrif. Dit is 'n ideale skraper om alge wat op klippe in vinnig-vloeiende water groei, te verwyder. As gevolg van hierdie aanpassing is dit nie nodig dat die mond wyd oopgemaak word nie en in vergelyking met ander geelvis is die keelwyk en die kake swak-beweeglik. Hierdie vis word so selde gevang dat dit onder hengelaars feitlik onbekend is. Dit kan egter gevang word met 'n baie klein hoekie en selfs dan word dit meesal nie in die mond gehaak nie.

Die voorste voelers is altyd afwesig. Die agterste voelers is aanwesig maar baie kort en in sommige eksemplare is 'n vergrootglas nodig om hulle te sien. Hulle is afgeplat met ronde of skerp punte en breë basisse.

Gedurende die broeiseisoen ontwikkel altwee geslagte opvallende wit, horingagtige knoppies, bekend as tuberkels, op die kop (sien fig. 11). Hierdie tuberkels is die grootste onderkant die neusgate. In mannetjies kom hulle ook voor op die kieudeksels, die skubbe van die liggaam en die vertakte strale van die rug- en anaalvin (sien fig. 12). Alle Transvaalse geelvis behalwe *B. rapax* ontwikkel tuberkels gedurende die broeiseisoen, maar hulle is mees opvallend in *Varicorhinus nelspruitensis.*

this species to be named " Paper-mouth " by anglers, but it is also known as " Silverfish " due to its bright silvery colour in turbid waters. In clear running water the general body-colour is light olive-green and the caudal and anal fins are orange-coloured. The sharply rising nape and elongated lower jaw, which projects bulldog-like beyond the upper jaw, are equally typical of the species.

The lips are thin and there is no mental lobe (see Fig. 8). The posterior pair of barbels are always present and nearly as long as the eye-diameter. The anterior barbels are feebly developed and one or both may be absent (see Fig. 7). There are 4 spines and 8 branched rays in the dorsal fin. The last spine is strongly enlarged and serrated but its tip is soft and flexible (see Fig. 6). There are 29–35 scales in the lateral line and 14 round the caudal peduncle.

This fish is not very popular amongst anglers as it rarely reaches a weight of more than 2 pounds. In Hartbeespoort and Loskop dams they are commonly caught while fishing for kurper or carp. They take an artificial fly readily when feeding at the surface.

VARICORHINUS NELSPRUITENSIS (Fig. 9).

SMALL-SCALED HORINGBEK YELLOWFISH.

The two species of *Varicorhinus* are typical yellowfishes in appearance and habits, but the exceptionally wide, square-shaped lower jaw with its well-developed muscles on the inside of the jaw and sharp, horny cutting ridge distinguishes them from all other species of Transvaal Yellowfish (see Fig. 10).

The broad, comparatively short head of *V. nelspruitensis* with its convex dorsal profile and wide mouth has a parrot-like appearance (see Fig. 11). The eyes are small and sunken into the head. The lips are thin, the ventral surface of the jaw is smooth and there is no chin lobe. The edge of the lower jaw is almost square and provided with a horny cutting ridge. This is an ideal scraper for removing algae growing on stones in swiftly running water. Because of this adaptation there is no need for the mouth to open wide, and compared with other yellowfish the throat region and the jaws are only feebly movable. For this reason this fish is so seldom caught that it is virtually unknown to anglers. It may, however, be taken on a very small hook and even then it is mostly foulhooked.

The front barbels are always absent. The hind barbels are present but very short, and in some specimens a hand lens is required to see them. They are flattened with rounded or pointed ends and broad bases.

During the spawning season both sexes develop conspicuous white horny warts, known as tubercles, on the head (see Fig. 11). These tubercles are largest just below the nostrils. In males they extend on to the gill-covers, the body scales and the branched rays of the dorsal and anal fins (see Fig. 12). All Transvaal yellowfish except *B. rapax* develop tubercles during the spawning season but they are most conspicuous in *Varicorhinus nelspruitensis*.

VARICORHINUS BRUCII (fig. 13).

GROOTSKUB HORINGBEK-GEELVIS.

Varicorhinus brucii kan van *V. nelspruitensis* onderskei word deur die kleiner aantal skubbe in die sylyn sowel as die teenwoordigheid van twee paar lang voelers op die bokaak (sien fig. 15). In die tabel hieronder is die verskille tussen die twee soorte breedvoerig uiteengesit.

KENMERK.	*V. NELSPRUITENSIS.*	*V. BRUCII.*
(A) SKUBBE		
(1) Sylyn..........	34–41....................	28–33.
(2) Stertstam.......	13–16, maar tipies 14......	12.
(3) Voor rugvin....	12–13....................	9–11.
(B) VOELERS..........	Voorste voelers afwesig, agterste voelers baie kort.	Altwee pare voelers teenwoordig en goedontwikkel.
(C) KIEUSIFGRATE OP EERSTE KIEUBOOG	22–26....................	19–21.

Die kop is breed en betreklik kort soos in *V. nelspruitensis*. Die onderkaak is kort, met goed-ontwikkelde spiere en 'n skerp horingsnyrif (sien fig. 14). Daar is 4 stekels en 8 of 9 vertakte strale in die rugvin. Die laaste stekel van die rugvin is effe vergroot, sag en buigbaar. Daar is 28 tot 33 skubbe in die sylyn en 12 rondom die stertstam.

Varicorhinus brucii is so nouverwant aan *Barbus brucii* dat dit onmoontlik is om die twee soorte te skei deur skubtellings en rugvin-formules te vergelyk. Die kop van *V. brucii* is duidelik breër as dié van *B. brucii*, maar die grootste en opvallendste verskil tussen die twee soorte is in die vorm van die onderkaak. In *Varicorhinus brucii* is die onder-oppervlakte van die onderkaak altyd heeltemal glad en 'n ken-lob is nooit teenwoordig nie (sien fig. 15). *Barbus brucii*, aan die ander kant, is met of sonder 'n ken-lob. Die vlak waarop die bokaak sluit, is laer as die buite-oppervlakte van die kaak, en die vel wat hierdie lysie bedek (minder as 'n kwart van die kaaklengte) is glad. In die *sector*-variëteit van *Barbus brucii* word die onderkaak ook gebruik om alge van klippe te skraap maar die horingsnyrif, wat so tipies van die genus *Varicorhinus* is, ontwikkel nooit. Die vorm van die kaak is ook verskillend. In *B. brucii* is dit betreklik lank en gerond, maar in *V. brucii* is dit veel korter, baie wyer en hoekig (sien fig. 15). Die verskil in vorm word duidelik gedemonstreer deur die wydte-lengte verhouding (wydte verdeel deur lengte), wat varieer van 1·6 tot 2·2 in *Barbus brucii* en van 2·8 tot 3·0 in *V. brucii*. Die verskil in die omvang van hierdie verhouding is daaraan te wyte dat die onderkaak van *V. brucii* nie alleen korter nie, maar ook wyer as dié van *B. brucii* is. In *B. brucii* is die lip aanwesig aan die kante van die onderkaak, in *V. brucii* is dit afwesig (vergelyk figure 15 en 18).

V. brucii leef gewoonlik in vinnig-vloeiende water op 'n klipperige bodem. Eksemplare tot 2½ pond is al in Transvaalse strome gevang met die gewone geelvis-aas.

VARICORHINUS BRUCII (Fig. 13).

LARGE-SCALED HORINGBEK YELLOWFISH.

Varicorhinus brucii may be distinguished from *V. nelspruitensis* by the smaller number of scales in the lateral line as well as the presence on the upper jaw of two pairs of well-developed barbels (see Fig. 15). In the table below a full list of the differences between the two species is given:—

CHARACTERISTIC.	*V. NELSPRUITENSIS.*	*V. BRUCII.*
(A) SCALES:		
(1) Lateral line.....	34–41....................	28–33.
(2) Caudal peduncle	13–16, but typically 14.....	12.
(3) Pre-dorsal.......	12–13....................	9–11.
(B) BARBELS..........	Front barbels absent, posterior barbels very short.	Both pairs of barbels present and well-developed.
(C) GILL-RAKERS ON FIRST GILL-ARCH	22–26....................	19–21.

The head is broad and comparatively short as in *V. nelspruitensis.* The lower jaw is short, with well-developed muscles and edged with a sharp, horny cutting ridge (see Fig. 14). There are 4 spines and 8 or 9 branched rays in the dorsal. The last dorsal spine is moderately enlarged, soft and flexible. There are 28–33 scales in the lateral line and 12 round the caudal peduncle.

Varicorhinus brucii is so closely allied to *Barbus brucii* that it is impossible to separate the two species by comparing scale counts or dorsal fin formulae. The head of V. *brucii* is distinctly broader than that of *B. brucii*, but the greatest and most noticeable difference between the two species is in the shape of the lower jaw. In *Varicorhinus brucii* the ventral surface of the lower jaw is always perfectly smooth and a mental lobe is never present (see Fig. 15). *Barbus brucii*, on the other hand, may be with or without a mental lobe. Its lower jaw is ledged where the upper lip closes on it and only the skin covering this ledge (less than a quarter of the length of the jaw) is smooth. In the *sector* variety of *Barbus brucii* the lower jaw is also used to scrape algae from stones, but the horny cutting ridge, which is so typical of the genus *Varicorhinus*, is never developed. The shape of the jaw is also different. In *B. brucii* it is comparatively long and rounded but in *V. brucii* it is shorter, much wider and angular (see Fig. 15). The difference in shape is clearly demonstrated by the width-length ratio (width divided by length) which varies from 1·6 to 2·2 in *Barbus brucii* and from 2·8 to 3·0 in *V. brucii.* The difference in the range of this ratio is due to the fact that the lower jaw of *V. brucii* is not only shorter but also much wider than that of *Barbus brucii.* In *B. brucii* the lip is present on the sides of the lower jaw, in *V. brucii* it is absent (compare Figs. 15 and 18).

V. brucii normally lives in swiftly flowing water with a rocky or stony bottom. It has been caught up to 2½ pounds in weight in Transvaal rivers on the usual yellowfish bait.

BARBUS BRUCII (fig. 16).

GROOTSKUB GEELVIS.

Hierdie is 'n grootskub-soort soos *B. rapax* en *V. brucii.* Van eersgenoemde kan dit egter onderskei word deur sy ongetande vierde stekel in die rugvin en van laasgenoemde deur die afwesigheid van 'n horingsnyrif op die onderkaak. Van die grootskub geelvisse van die Limpopo-, Inkomati- en Usutusisteme is hierdie soort ongetwyfeld die volopste. Sover bekend bereik dit 'n gewig van 12 pond maar vis wat 7 tot 9 pond weeg, word dikwels deur hengelaars aangemeld.

Drie verskillende variëteite, wat voorheen as aparte soorte beskou is, kan onderskei word. Eerstens is daar die variëteit wat geen ken-lob het nie en bekend is as die *sector*-variëteit van *Barbus brucii.* Die onderkaak het 'n skerp rand, maar 'n horingsnyrif soos in die twee soorte *Varicorhinus* ontbreek (sien fig. 17 en 18).

In die tweede variëteit is die onderlip aaneenlopend oor die ken en daar is 'n kort ken-lob (sien fig. 19).

In eksemplare wat intermediêr is, is die ken-bel óf swak ontwikkel óf net aangedui deur 'n onderbroke groef op die ken (sien fig. 18). Die ken-bel het feitlik heeltemal verdwyn in 'n tipiese eksemplaar van die variëteit met 'n ken-bel nadat dit oorgeplaas is van 'n poel met modderige bodem na 'n beton opgaardam. Die ontwikkeling van die lippe en die ken-bel het dus geen taksonomiese betekenis nie.

Die derde variëteit word gekenmerk deur die uitermate verdikte lippe wat die paslike naam „rubberlippe" van hengelaars ontvang het (sien fig. 20 en 21).

Min is bekend oor die betekenis van rubberlippe. 'n Rubberlip-eksemplaar van *Barbus holubi* is in 'n vinnig-vloeiende gedeelte van Vaalrivier gevang en na die Provinsiale Visseryinstituut gebring, waar dit in 'n klein dam met staande water en sagte modderbodem gehou is. Die rubberlippe het geleidelik dunner geword en na 'n periode van amper een jaar kon hierdie eksemplaar nouliks van die dunlip-vorm onderskei word. Hierdie resultaat dui daarop dat rubberlippe in verband staan met een of ander aspek van 'n lewe op 'n klipperige bodem in vinnig-lopende water. Die rubberlip-variëteit van *B. brucii* het 'n opvallende langer kop as die ander twee variëteite en dit word veroorsaak deurdat rubberlip-eksemplare 'n langer snoet het. Dit is selfs in klein eksemplare merkbaar.

Barbus brucii het 27 tot 33 skubbe in die sylyn en 12 rondom die stertstam. Die rugvin-formule is iv 8–10. Die laaste stekel van die rugvin is dun en buigsaam. Daar is twee paar lang voelers wat ietwat korter as die deursnit van die oog is. Die eerste stekel van die buikvin ontspring vertikaal onder die voorste strale van die rugvin.

BARBUS MAREQUENSIS (fig. 22).

KLEINSKUB LAEVELD-GEELVIS.

B. marequensis, wat net in die drie oos-vloeiende riviersisteme van Transvaal voorkom, is 'n kleinskub-soort en maklik onderskeibaar van die ander kleinskub-soort, *V. nelspruitensis,* wat ook in hierdie sisteme voorkom.

BARBUS BRUCII (Fig. 16).

LARGE-SCALED YELLOWFISH.

This is a large-scaled species like *B. rapax* and *V. brucii.* It may, however, be distinguished from the former by its non-serrated fourth dorsal spine and from the latter by the absence of a horny cutting ridge on the lower jaw. This species is undoubtedly the most common of the large-scaled yellowfishes occurring in the Limpopo, Incomati and Usutu Systems. It is known to reach a weight of 12 pounds, and fish weighing 7 to 9 pounds are often reported by anglers.

Three different varieties, which were formerly regarded as separate species, may be distinguished. Firstly we have the variety which has no mental lobe and is known as the *sector* variety of *Barbus brucii.* The lower jaw is sharp-edged, but without a horny cutting ridge as in the two species of *Varicorhinus* (see Figs. 17 and 18).

In the second variety the lower lip is continuous across the chin and there is a short mental or chin lobe (see Fig. 19).

In specimens which are intermediate the mental lobe may be either under-developed or represented by a discontinuous groove on the chin (see Fig. 18). The lobe disappeared almost completely in a typical specimen of the mental lobe variety after being transferred from a pool with muddy bottom to a cement reservoir. No specific importance should therefore be attached to the differences in the development of lips and the mental lobe.

The third variety is characterized by the extremely thickened lips, which have been aptly named " rubberlips " by anglers (see Figs. 20 and 21).

Little is known about the adaptive significance of rubberlips. A rubberlip specimen of *Barbus holubi* was caught in a fast-flowing section of the Vaal River and brought to the Provincial Fisheries Institute, where it was kept in a small pond with standing water and a soft muddy bottom. The rubberlips gradually became thinner and after a period of nearly one year this specimen could hardly be distinguished from the thin-lipped form. This evidence seems to indicate that rubberlips are connected with some or other aspect of a life on a stony bottom in swiftly running water.

The rubberlip variety of *B. brucii* has a distinctly longer head than the other two varieties, and this is caused by the longer snout of rubberlips. This is evident even in small specimens.

Barbus brucii has 27–33 scales in the lateral line and 12 round the caudal peduncle. The dorsal fin formula is iv 8–10. The last dorsal spine is thin and flexible. There are two pairs of well-developed barbels, only a little shorter than the eye-diameter. The first pelvic spine originates vertically below the front rays of the dorsal fin.

BARBUS MAREQUENSIS (Fig. 22).

SMALL-SCALED LOWVELD YELLOWFISH.

B. marequensis, which occurs only in the three east-flowing river systems of the Transvaal, is a small-scaled species and very easy to distinguish from the other small-scaled species, *V. nelspruitensis*, inhabiting these systems.

Laasgenoemde soort het net een paar voelers en 'n skerp horingsnyrif op die onderkaak in teenstelling met *B. marequensis* wat twee paar lang voelers het, 'n bel op die ken en geen snyrif op die onderkaak nie (sien fig. 23). Dit word tot 15 pond swaar en word deur hengelaars as 'n goeie vegter beskou. In helder water kan dit met kunsaas gevang word.

In uitwendige voorkoms stem hierdie soort so baie ooreen met *B. holubi* van die Vaalrivier dat dit as dieselfde soort beskou is (vergelyk fig. 22 en 26 asook 24 en 27). Selfs in helder water ontwikkel *B. marequensis* egter nooit die goudgeel kleur wat onder dergelike omstandighede so tipies van *B. holubi* is nie, maar die rug is lig olyfgroen en die sye silwer. Dit is egter in die kleur van die vinne dat ons iets vind wat kenmerkend van *B. marequensis* is. Die onderste helfte van die stertvin, die anale vin sowel as die gepaarde vinne is naamlik donker van kleur. Dit is nie waargeneem in enige van die ander Transvaalse geelvisse nie.

Die belangrikste verskil tussen *holubi* en *marequensis* is egter te vinde in die posisie van die buikvin en in die dikte van die laaste stekel van die rugvin. In *holubi* ontspring die eerste straal van die buikvin duidelik vóór die eerste stekel van die rugvin, maar in *marequensis* altyd onder die voorste strale van die rugvin, d.w.s. nooit vertikaal vóór die eerste rugvinstekel nie (sien fig. 22). Die laaste rugvinstekel is sterk vergroot in *B. holubi* en dit vorm 'n dik stekel, maar in *B. marequensis* is dit net effe vergroot en buigsaam (vergelyk fig. 25 en 29).

BARBUS HOLUBI (fig. 26).

KLEINBEK GEELVIS.

Die gewildheid van hierdie Vaalrivier-geelvis as 'n sportvis is sonder gelyke in Transvaal. Dit bereik 'n gewig van swaarder as 30 pond en kan met 'n verskeidenheid van aas soos mieliepap, erdwurms, sprinkane, kunslokmiddels en forelvlieë gevang word. Dit aard goed in die rivier sowel as die staande water van Vaaldam en Barberspan.

In helder water is die kleur van *Barbus holubi* heldergeel met donker spikkels, maar in troebel water het dit 'n silwer kleur met net 'n skynsel van geel. Kleintjies tot 'n lengte van drie duim het onreëlmatige vlekke en strepe op die rug en sye, wat dien om hulle van die ghilliemientjies van Vaalrivier te onderskei.

Die rugvin het 4 stekels en 7 tot 9 vertakte strale. Die laaste rugvinstekel is sterk vergroot en soms ontspring die hele buikvin voor die rugvin. Daar is 36 tot 44 skubbe in die sylyn, 6 tussen die sylyn en die middel van die rug, 6 of 7 tussen die sylyn en die middel van die buik en 3 tot 5 tussen die sylyn en die basis van die buikvin. Alhoewel die tipiese getal skubbe om die stertstam 16 is, wissel die getal van 14 tot 18. Die verskille tussen die twee soorte geelvis van Vaalrivier word onder *B. kimberleyensis* bespreek.

BARBUS KIMBERLEYENSIS (fig. 30).

GROOTBEK GEELVIS.

Alhoewel twee soorte geelvis vir baie jare in Vaalrivier aan hengelaars bekend was, was dit eers in 1949 dat 'n tweede soort onder die aandag van die wetenskaplikes gekom het. Dit is as 'n nuwe soort onder die naam

The latter species has only one pair of barbels and a sharp horny cutting ridge on the lower jaw in contrast with *B. marequensis* which has two pairs of long barbels, a lobe on the chin and no cutting ridge on the lower jaw (see Fig. 23). It grows to a weight of 15 pounds and is regarded by anglers as a good fighter. In clear water it may be caught on an artificial lure.

This species so closely resembles *Barbus holubi* of the Vaal River in general appearance that it was regarded as the same species (compare Figs. 24 and 27 as well as 22 and 26). Even in clear water *B. marequensis* never develops the golden yellow colour which under the same circumstances is so typical of *B. holubi*, but the back is a pale olive-green and the sides are silver. It is, however, in the coloration of the fins that we find something which is characteristic of *B. marequensis*. The ventral lobe of the caudal, the anal as well as the paired fins are dark coloured. This has not been observed in any other Transvaal yellowfish.

The most important difference between *holubi* and *marequensis* is, however, to be found in the position of the ventral fin and the thickness of the last dorsal spine. In *holubi* the first simple ray of the ventral originates clearly in advance of the first dorsal spine, but in *marequensis* its position is always below the front rays of the dorsal, i.e. never vertically in advance of the first dorsal spine (see Fig. 22). The last dorsal spine is strongly enlarged in *B. holubi* and it forms a thick spine, but in *B. marequensis* it is but moderately enlarged and flexible (compare Figs. 25 and 29).

BARBUS HOLUBI (Fig. 26).

SMALLMOUTH YELLOWFISH.

As a sporting fish the popularity of this golden beauty of the Vaal River is without equal in the Transvaal. It grows to over 30 pounds in weight and may be caught on a variety of baits like mealie porridge, earthworms, grasshoppers, crabs, artificial lures and trout flies. It thrives both in the river itself and in the standing water of the Vaal Dam and Barberspan.

In clear water the colour of *B. holubi* is a bright yellow speckled with dark spots, whereas in turbid waters it is silvery with only a shade of yellow. Up to a length of about three inches the young have irregular dark spots and bars on the back and sides which serve to distinguish them from the ghilliemientjies of the Vaal River.

The dorsal fin has 4 spines and 7 to 9 branched rays. The last dorsal spine is strongly enlarged and sometimes the whole of the pelvic fin originates in advance of the dorsal fin. There are 36–44 scales in the lateral line, 6 between the lateral line and the middle of the back, 6 or 7 between the lateral line and the middle of the belly and 3 to 5 between the lateral line and the base of the pelvic fin. There may be from 14 to 18 scales round the caudal peduncle but 16 is the typical number. For the differences between the two yellowfishes of the Vaal River, see under *B. kimberleyensis*.

BARBUS KIMBERLEYENSIS (Fig. 30).

LARGEMOUTH YELLOWFISH.

Although for many years anglers recognised two kinds of yellowfish from the Vaal River it was not until 1949 that the second species came to the notice of the scientists. It was described as a new species under the name of

Barbus pienaarii beskryf. As gevolg van hierdie hersiening van die Transvaalse geelvisse weet ons nou dat dit sinoniem is met *B. kimberleyensis*, wat in 1913 van die Kimberleyse reservoir beskryf is. Die ouer naam moet dus behou word.

Die kenmerke wat gewoonlik gebruik word om die verskillende ander geelvisse uit te ken, kan nie gebruik word om hierdie soort van *B. holubi* te onderskei nie. Skubtellings, tellings van vinstrale en liggaamsverhoudings is min of meer identies. Ten spyte hiervan is die leefwyse van die twee soorte heel verskillend.

Die kleinbek is 'n omnivore bodemvreter wat van waterlewende insekIarwes, groen draadwier en sagte waterplante lewe. Gevolglik het dit 'n klein mond, wat na onder open, swak-beweeglike kake (sien fig. 27 en 28), en 'n effe langer dunderm vir die vertering van plantemateriaal. Die lippe is dun, maar is soms verdik om rubberlippe te vorm.

Die grootbek is 'n roofvis en sy tipiese habitat is vinnig-vloeiende water waar hy op klein vissies jag maak. Sy roofsugtige leefwyse word weerspieël in die kleiner aantal kieusifgrate en korter dunderm. Die kop is ook aangepas om bewegende prooi te vang. Dit is lank met 'n groot mond wat uitermate wyd en reg na voor oopmaak (sien fig. 31 en 32). Hierdie verskil in die mond van *kimberleyensis* is veral opvallend wanneer die vis uit die water verwyder word, want dit gaap dan op 'n kenmerkende manier deur die mond wyd oop te maak en die keelwyk en kieudeksels ten volle uit te dy, presies soos 'n grootbek-swartbaars. Hierdie uitgedyde toestand van die keel en kieudeksels word dikwels ook by dooie vis aangetref.

Wanneer die kop van die kant beskou word met die mond gesluit, word die punt van die kop gevorm deur die snoet in *holubi* en deur die onderkaak of beide kake in *kimberleyensis* (vergelyk fig. 27 en 31).

Die lippe van *kimberleyensis* is dun en ontwikkel nooit tot rubberlippe nie. Die sterk kaakspiere bult uit op die wange terwyl die bene van die keelwyk vrylik artikuleer en die vis in staat stel om groot prooi te vang (sien fig. 32). Die kop is smaller as in die kleinbek en die oë sit hoër-op in die kop. Wanneer 'n grootbek van langer as 16 duim van onder af beskou word, is die oë nie sigbaar nie, terwyl die oë altyd van onder sigbaar is in die geval van die kleinbek. In die kleinbek is die bo-profiel van die kop konveks, maar in die grootbek is dit afgeplat met 'n hoë skof agter die kop.

B. kimberleyensis is uniek onder die geelvisse van Transvaal in soverre die afstand van die oog tot die wanggroef gelyk of groter is as die lengte van die snoet. Hierdie is die enigste betroubare kenmerk waardeur *kimberleyensis* onderskei kan word van *holubi* of enige ander Transvaalse geelvis (vergelyk fig. 27 en 31).

Barbus pienaarii. As a result of the present revision of the yellowfishes we now know that it is synonymous with *B. kimberleyensis* described from the Kimberley reservoir in 1913. Therefore, the older name must be retained.

The characteristics normally used to distinguish the various other yellowfishes fail to separate this fish from *Barbus holubi.* Scale counts, fin ray counts and body proportions are more or less identical. Nevertheless these two fishes lead widely different lives.

The smallmouth is an omnivorous bottom feeder living on aquatic insect larvae, filamentous green algae and soft aquatic plants. Consequently it has a small mouth opening downward with poorly movable jaws (see Figs. 27 and 28) and a slightly longer intestine for the digestion of plant material. The lips are thin but sometimes thickened to form rubberlips.

The largemouth is a carnivorous species and its typical habitat is rapid water where it preys on small fishes. Its carnivorous habits are reflected in the smaller number of gill-rakers on the first gill-arch and a shorter intestine. The head is also adapted to the capture of moving prey. It is long with a large mouth which opens extremely wide and directly to the front (see Figs. 31 and 32). This difference in the mouth of *kimberleyensis* is most noticeable when the fish is removed from the water, because it then gapes in a characteristic way, opening the mouth wide and fully extending the throat region and gill-covers, just like a largemouth bass. This extended condition of the throat and gill-covers is often maintained after death.

When the head is viewed from the side with the mouth closed, the tip of the head is formed by the snout or nose in *holubi* and by the lower jaw or both jaws in *kimberleyensis* (compare Figs. 27 and 31).

The lips of *kimberleyensis* are thin and never develop into rubberlips. The strong jaw muscles bulge out on the cheeks while the bones of the throat region are loosely articulated to enable the fish to swallow large prey (see Fig. 32). The head is narrower than in the smallmouth and the eyes situated nearer to the top of the head. When a largemouth of over 16 inches is viewed from below the eyes are not visible, whereas in the case of a smallmouth the eyes are always visible from below. In the smallmouth the dorsal profile of the head is rounded, but in the largemouth it is depressed and flat and the nape rises sharply behind the head.

B. kimberleyensis is unique amongst Transvaal yellowfishes in having the distance from the eye to the cheek-groove equal to or greater than the length of the snout. This is the only reliable characteristic by which *kimberleyensis* may be distinguished from *holubi* or from any other Transvaal yellowfish (compare Figs. 27 and 31).

'N VERGELYKING VAN DIE TRANSVAALSE GEELVISSOORTE.

Soort.	Verspreiding (sisteme).	Laaste rugvinstekel.	Snyrif op onderkaak.	Getal sylynskubbe.
1. *B. rapax*	Limpopo	Sterk en getand	Afwesig	29–33.
2. *V. brucii*	Limpopo. Inkomati en Usutu	Effe verdik en ongetand.	Aanwesig	28–33.
3. *V. nelspruitensis*	Limpopo, Inkomati en Usutu	Dun en ongetand	Aanwesig	35–41.
4. *B. brucii*	Limpopo, Inkomati en Usutu	Verdik en ongetand	Afwesig	27–33.
5. *B. marequensis*	Limpopo, Inkomati en Usutu	Verdik en ongetand	Afwesig	36–44.
6. *B. kimberleyensis*	Vaalrivier	Verdik en ongetand	Afwesig	36–45.
7. *B. holubi*	Vaalrivier	Verdik en ongetand	Afwesig	36–45.

A COMPARISON OF THE TRANSVAAL SPECIES OF YELLOWFISH.

Species.	Distribution (Systems).	Last Dorsal Spine.	Cutting Ridge on Lower Jaw.	Number of Lateral Line Scales.
1. *B. rapax*	Limpopo	Strong and serrated	Absent	29–33.
2. *V. brucii*	Limpopo, Incomati and Usutu	Slightly thickened and unserrated	Present	28–33.
3. *V. nelspruitensis*	Limpopo, Incomati and Usutu	Thin and unserrated	Present	35–41.
4. *B. brucii*	Limpopo, Incomati and Usutu	Thickened and unserrated	Absent	27–33.
5. *B. marequensis*	Limpopo, Incomati and Usutu	Thickened and unserrated	Absent	36–44.
6. *B. kimberleyensis*	Vaal River	Thickened and unserrated	Absent	36–45.
7. *B. holubi*	Vaal River	Thickened and unserrated	Absent	36–45.

GEOGRÁFIESE VERSPREIDING VAN GEELVISSE IN TRANSVAAL.

RIVIERSISTEEM.	SOORT.
A. Limpopo	*B. rapax.*
	B. brucii.
	B. marequensis.
	V. nelspruitensis.
	V. brucii.
B. Inkomati	*B. brucii.*
	B. marequensis.
	V. nelspruitensis.
	V. brucii.
C. Usutu	*B. brucii.*
	B. marequensis.
	V. nelspruitensis.
	V. brucii.
D. Vaalrivier	*B. holubi.*
	B. kimberleyensis.

GEOGRAPHICAL DISTRIBUTION OF YELLOWFISH IN THE TRANSVAAL.

RIVER SYSTEM.	SPECIES.
A. Limpopo	*B. rapax.* *B. brucii.* *B. marequensis.* *V. nelspruitensis.* *V. brucii.*
B. Incomati	*B. brucii.* *B. marequensis.* *V. nelspruitensis.* *V. brucii.*
C. Usutu	*B. brucii.* *B. marequensis.* *V. nelspruitensis.* *V. brucii.*
D. Vaal River	*B. holubi.* *B. kimberleyensis.*

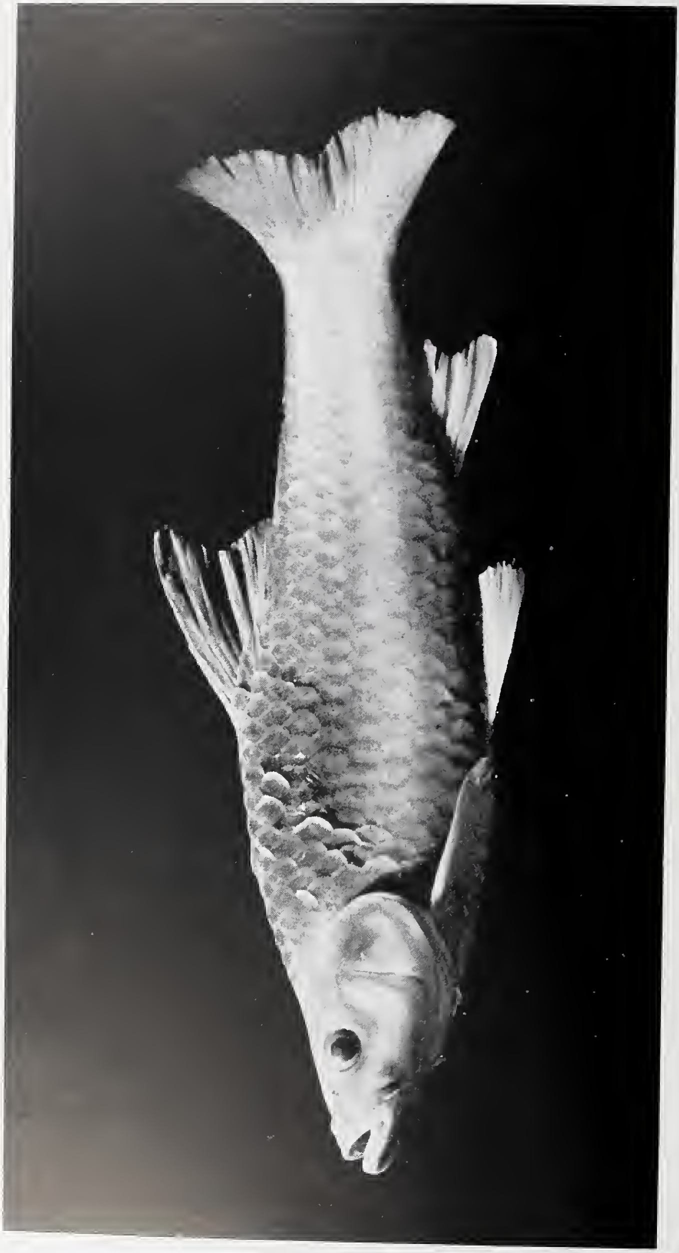

Fig. 5.—*Barbus rapax.*

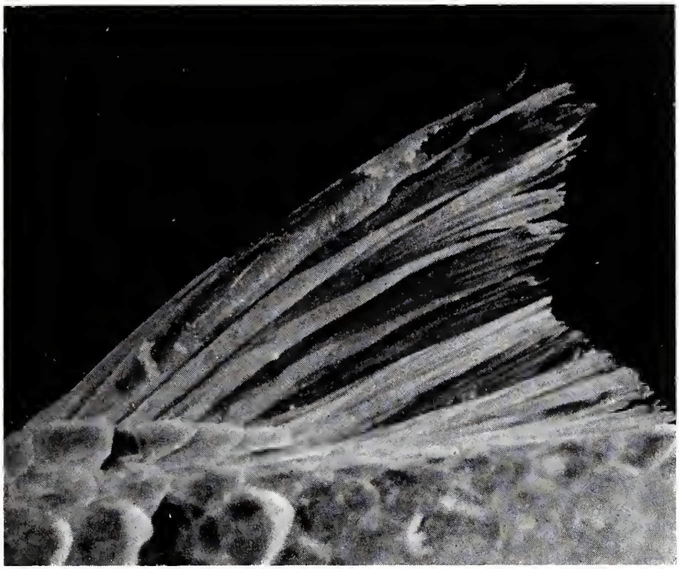

Fig. 6.—Dorsal fin of *B. rapax*. Fig. 6.—Rugvin van *B. rapax*.

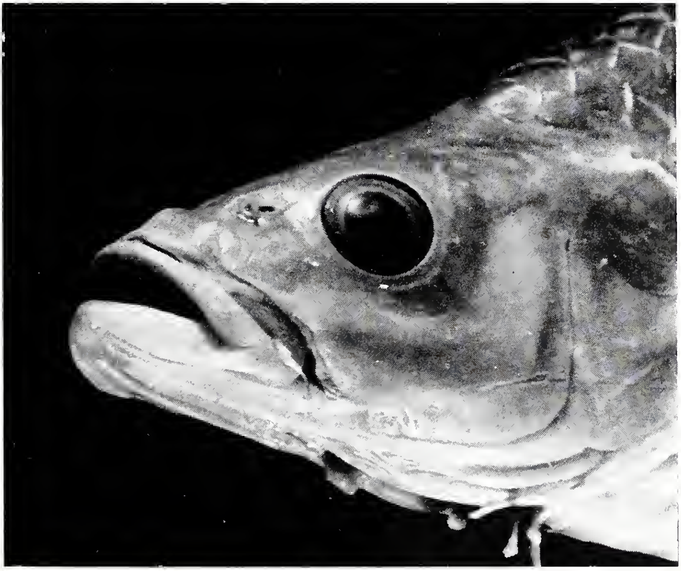

Fig. 7.—Head of *B. rapax*. Fig. 7.—Kop van *B. rapax*.

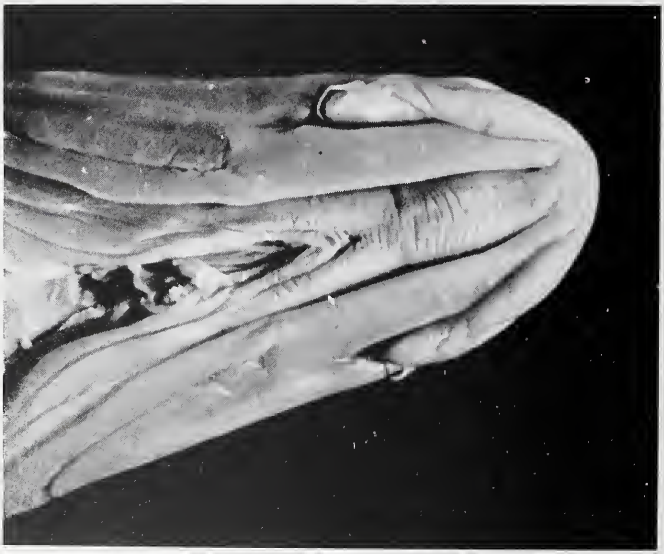

Fig. 8.—Onderkaak van *B. rapax*. Fig. 8.—Lower Jaw of *B. rapax*.

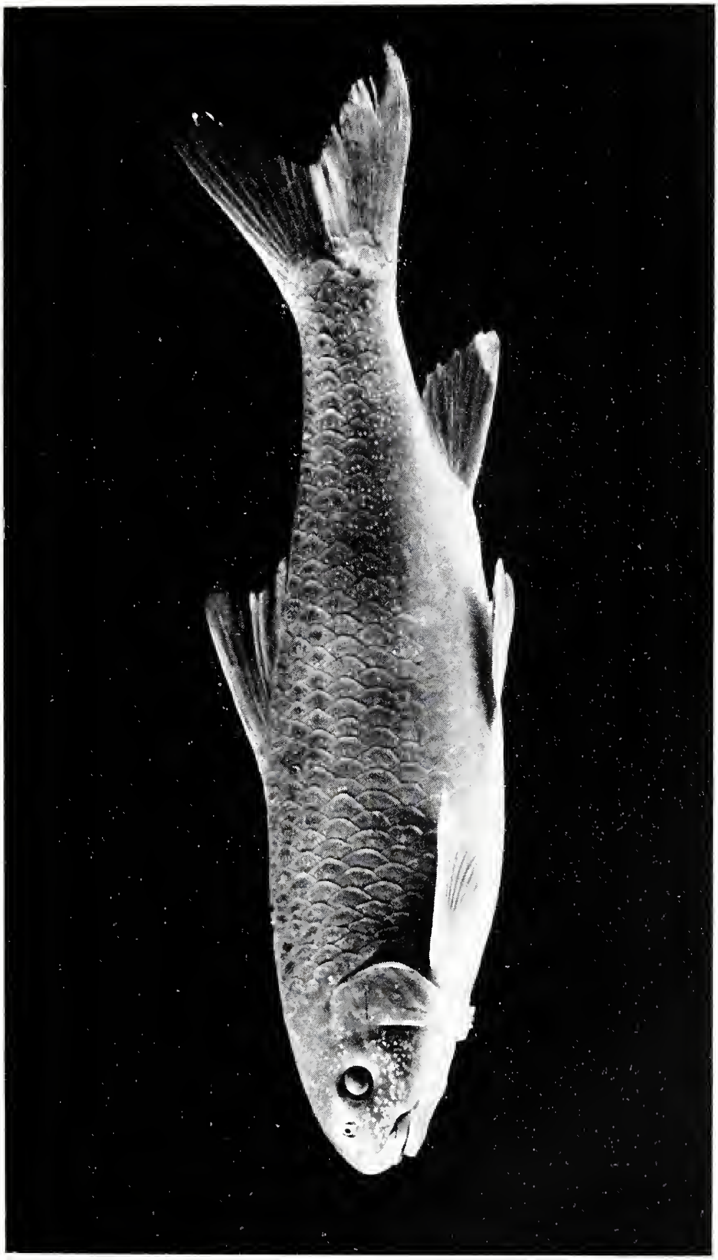

FIG. 9.—*Varicorhinus nelspruitensis.*

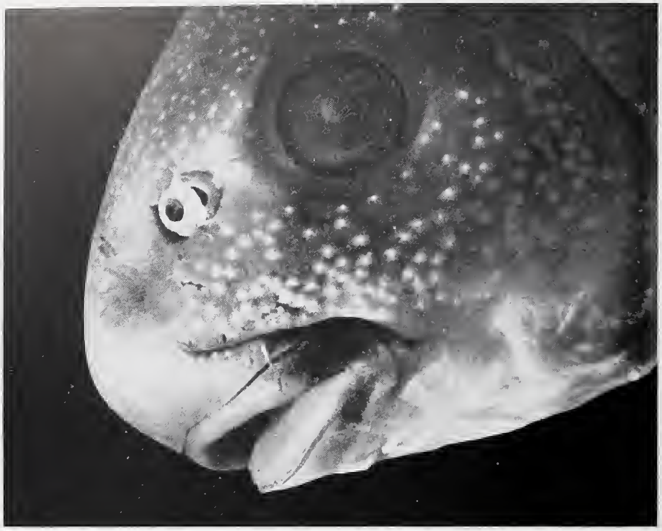

FIG. 10.—Onderkaak van *V. nelspruitensis.*

FIG. 10.—Lower Jaw of *V. nelspruitensis.*

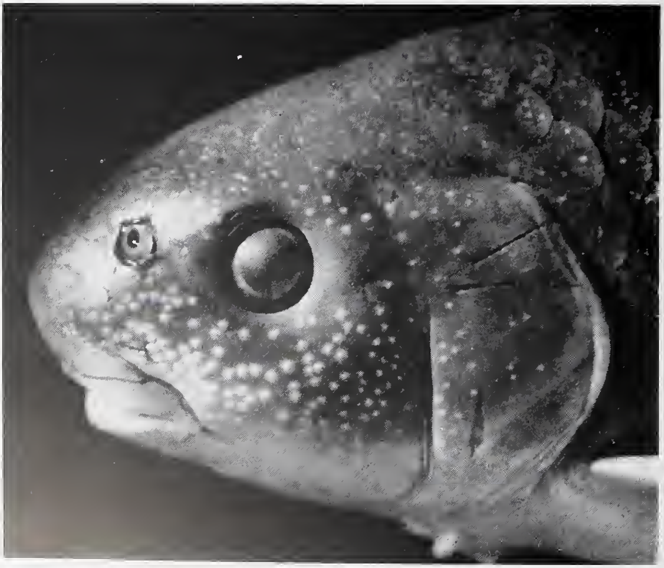

FIG. 11.—Kop van *V. nelspruitensis.*

FIG. 11.—Head of *V. nelspruitensis.*

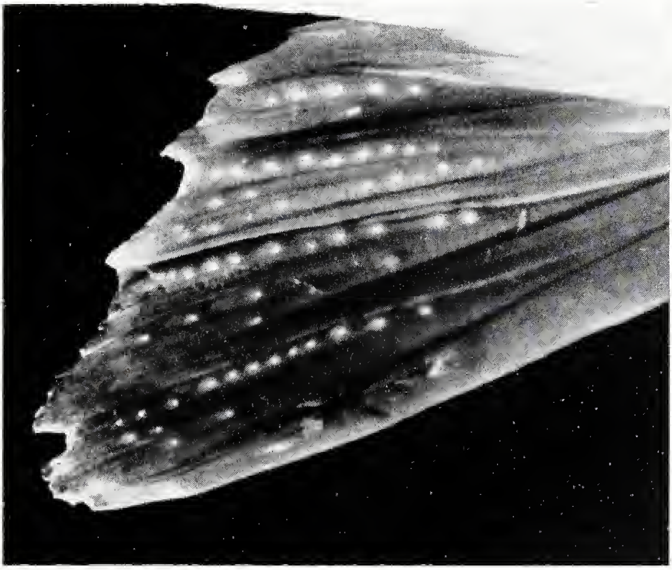

FIG. 12.—Anal Fin of *V. nelspruitensis* Male.

FIG. 12.—Anaalvin van *V. nelspruitensis*-mannetjie.

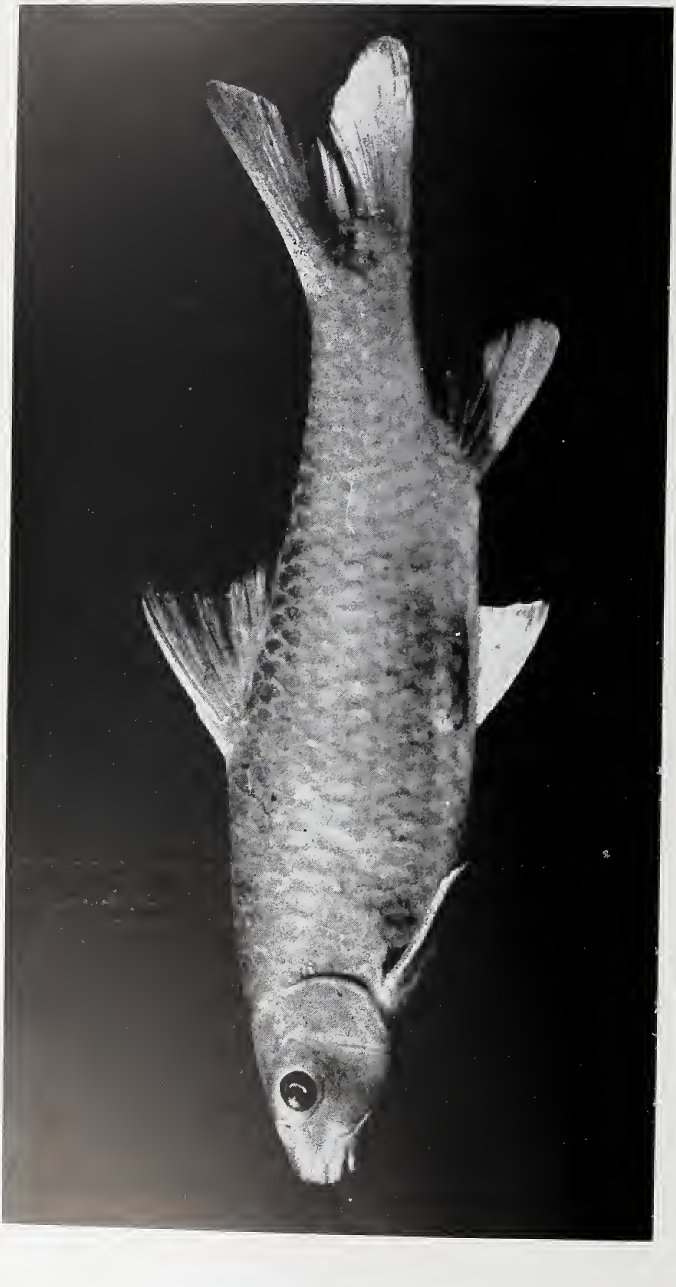

FIG. 13.—*Varicorhinus brucii.*

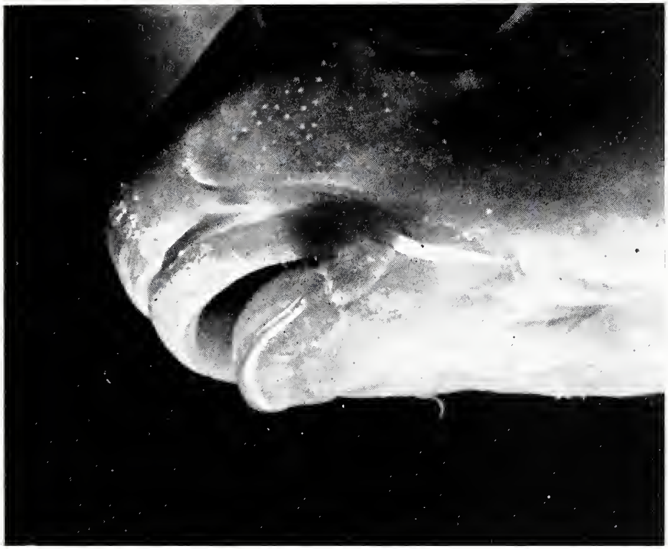

FIG. 14.—Mouth of *V. brucii.* FIG. 14.—Mond van *V. brucii.*

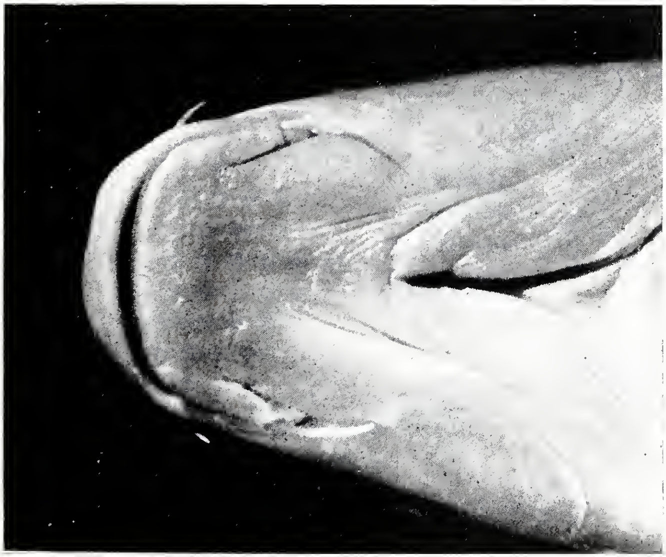

FIG. 15.—Lower Jaw of *V. brucii.* FIG. 15.—Onderkaak van *V. brucii.*

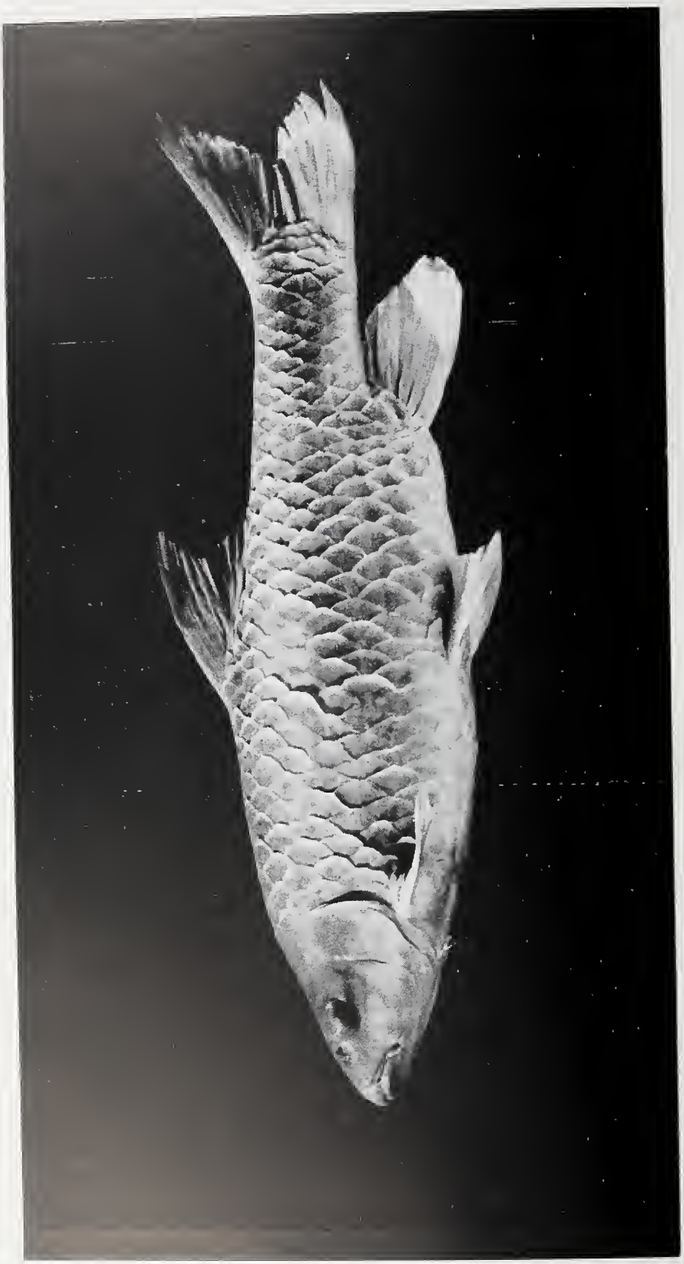

FIG. 16.—*Barbus brucii.*

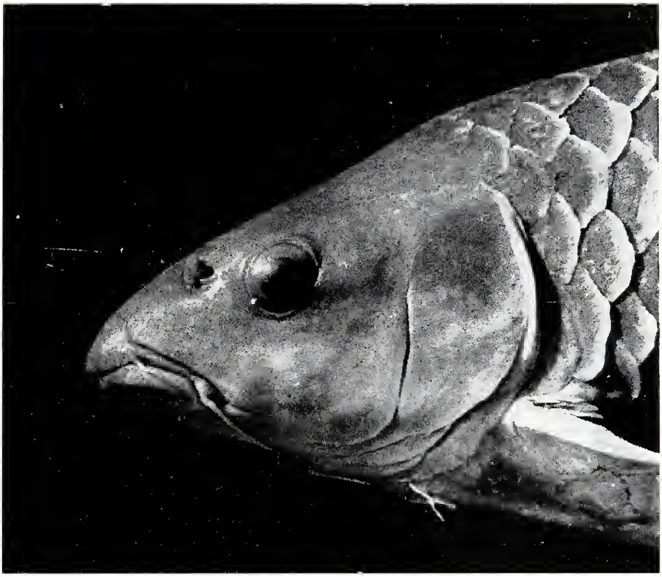

FIG. 17.—Head of *B. brucii* (*sector* variety).

FIG. 17.—Kop van *B. brucii* (*sector*-variëteit).

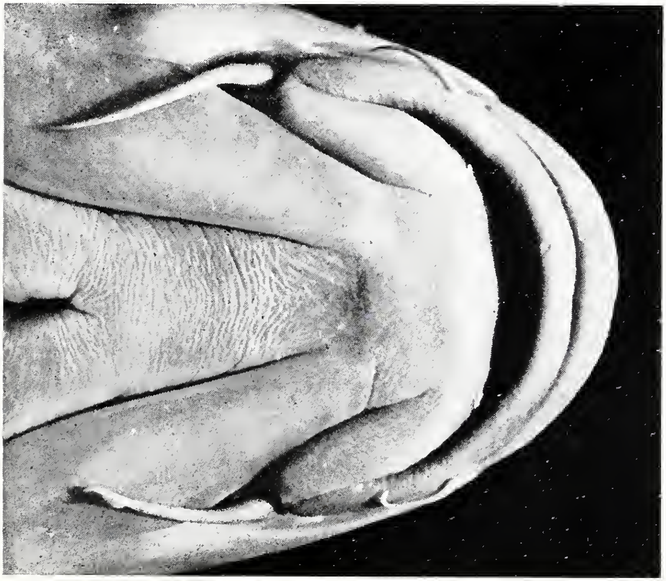

FIG. 18.—Lower Jaw of *B. brucii* (*sector* variety).

FIG. 18.—Onderkaak van *B. brucii* (*sector*-variëteit).

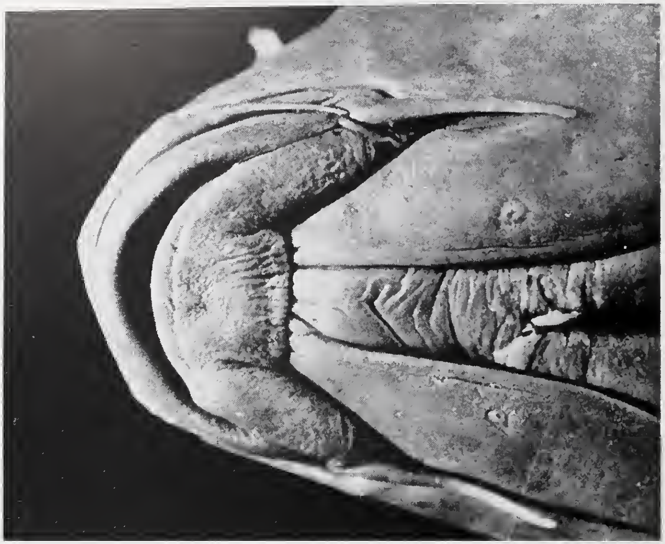

FIG. 19.—Onderkaak van *B. brucii* (variëteit met 'n kort ken-bel en dun lippe).

FIG. 19.—Lower Jaw of *B. brucii* (variety with a short mental lobe and thin lips)

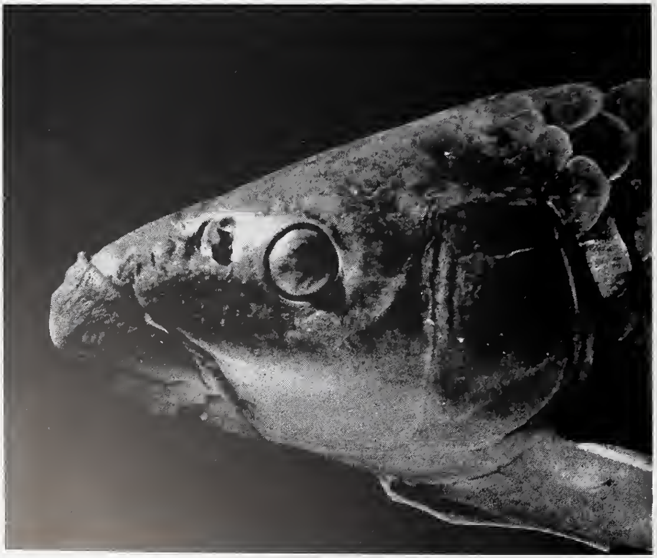

FIG. 20.—Kop van *B. brucii* (rubberlip-variëteit).

FIG. 20.—Head of *B. brucii* (rubberlip variety).

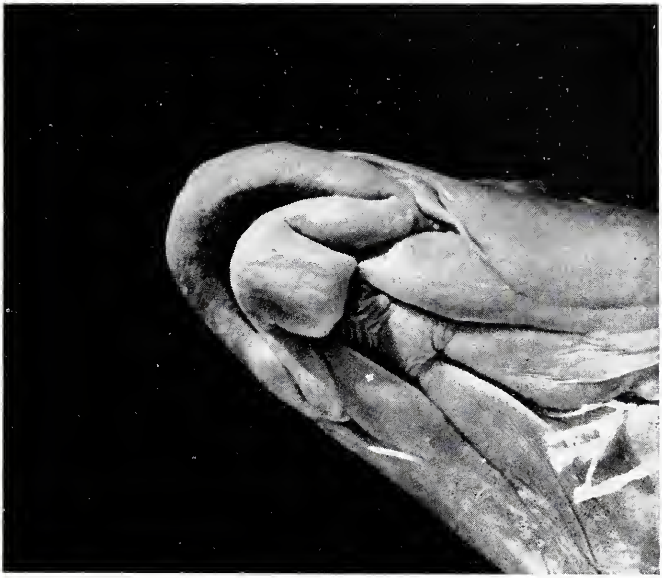

FIG. 21.—Lower Jaw of *B. brucii* (rubberlip variety).

FIG. 21.—Onderkaak van *B. brucii* (rubberlip-variëteit).

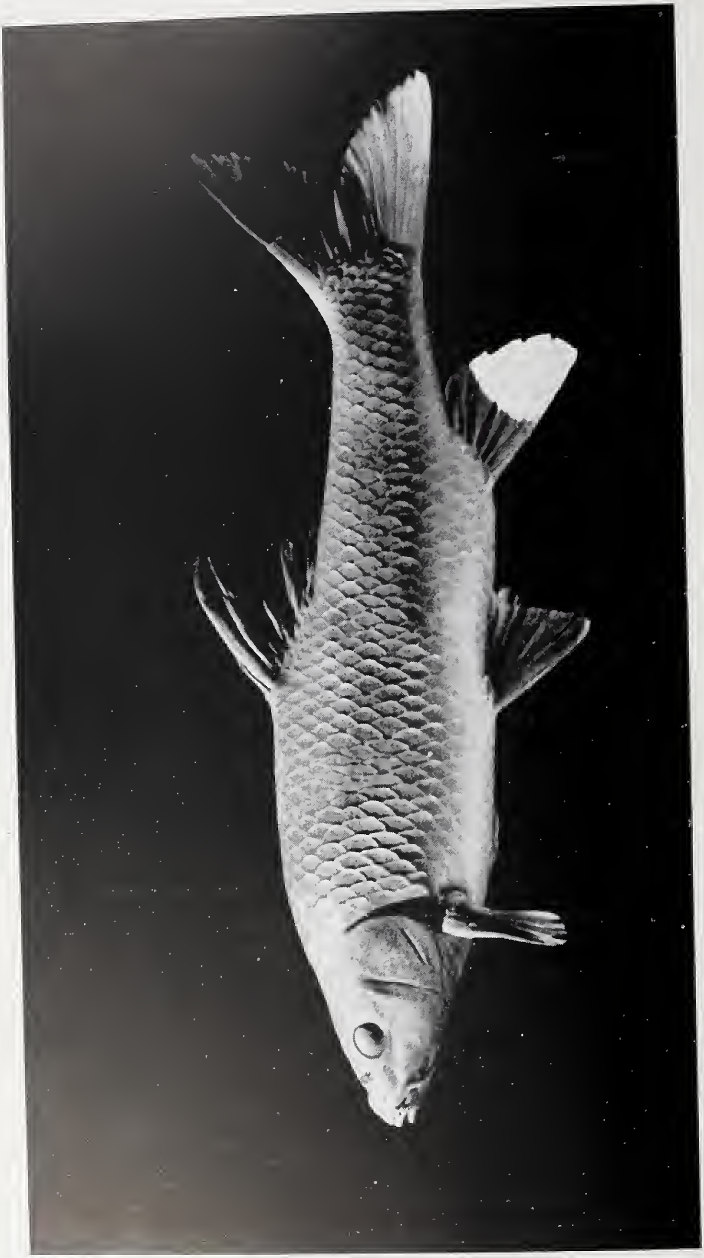

Fig. 22.—*Barbus marequensis.*

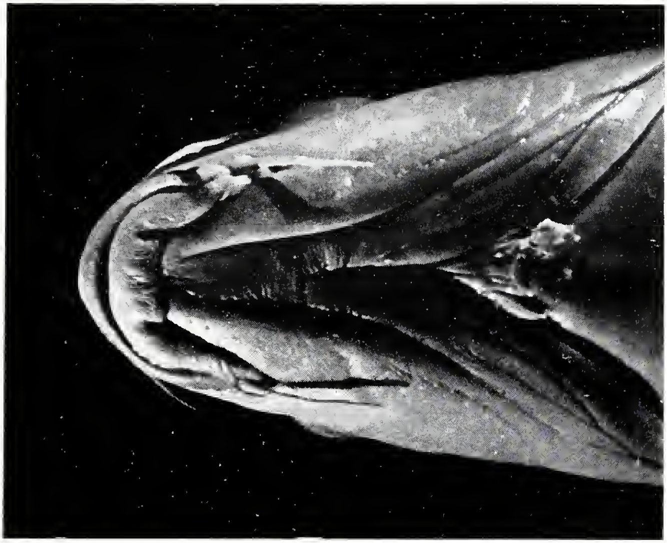

FIG. 23.—Lower Jaw of *B. marequensis*.

FIG. 23.—Onderkaak van *B. marequensis*.

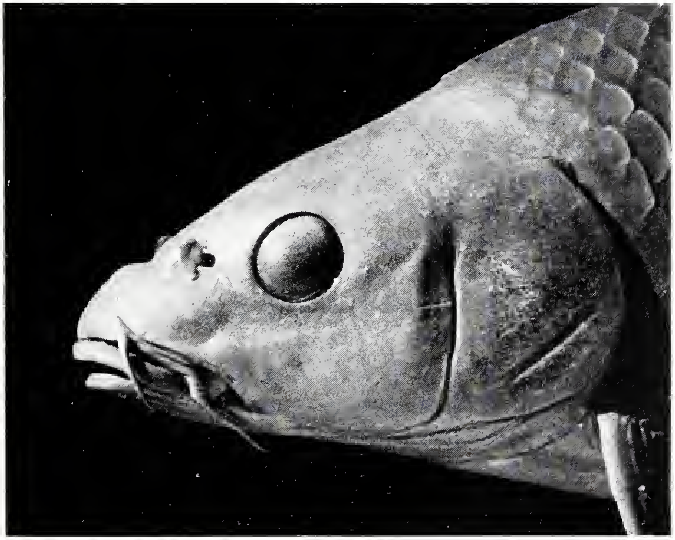

FIG. 24.—Head of *B. marequensis*.

FIG. 24.—Kop van *B. marequensis*.

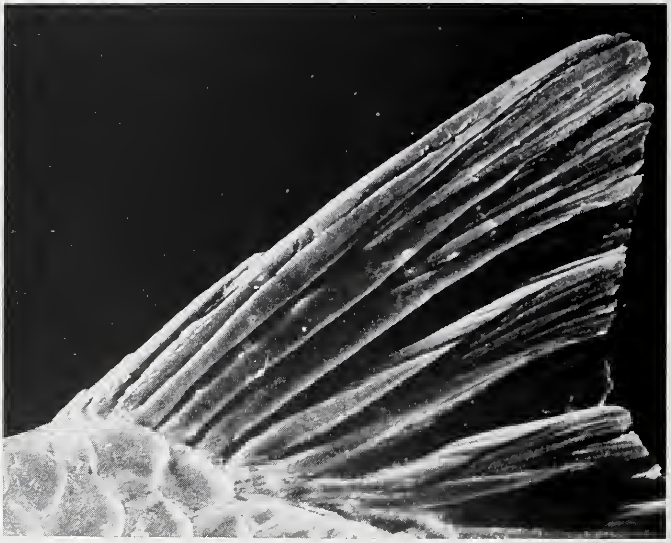

FIG. 25.—Rugvin van *B. marequensis*. FIG. 25.—Dorsal fin of *B. marequensis*.

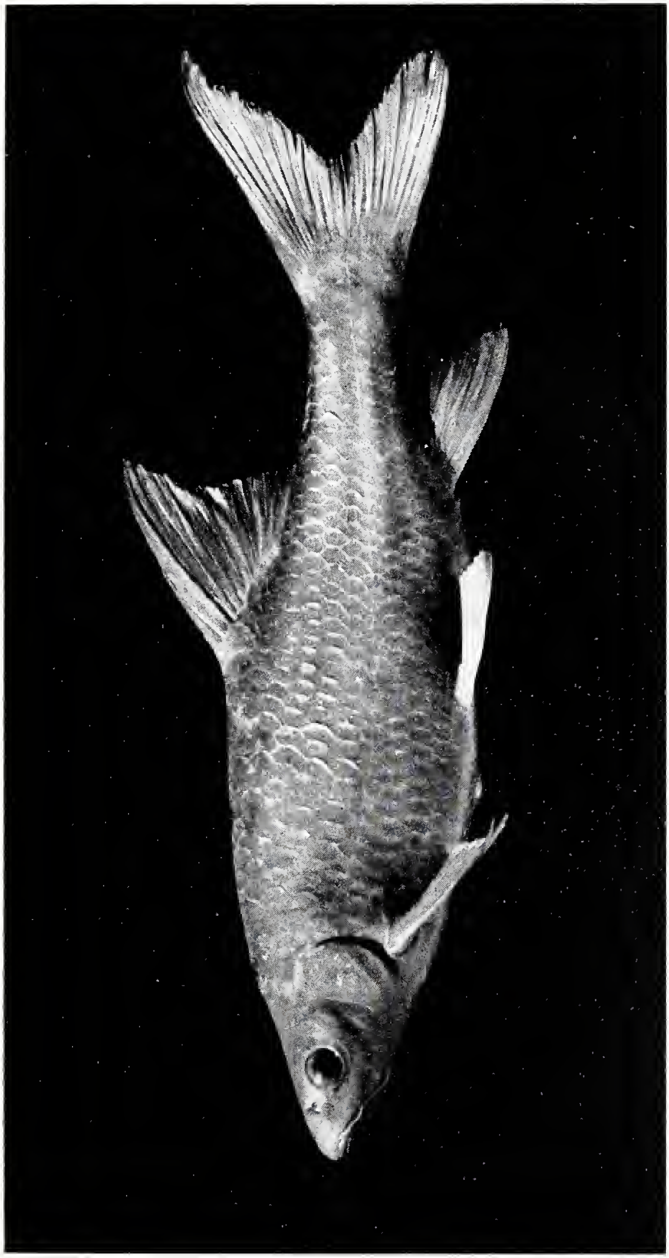

Fig. 26.—*Barbus holubi.*

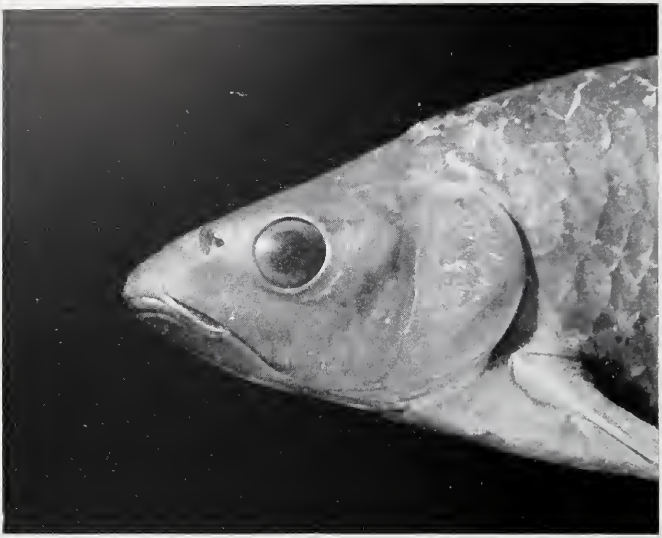

FIG. 27.—Kop van *B. holubi.* FIG. 27.—Head of *B. holubi.*

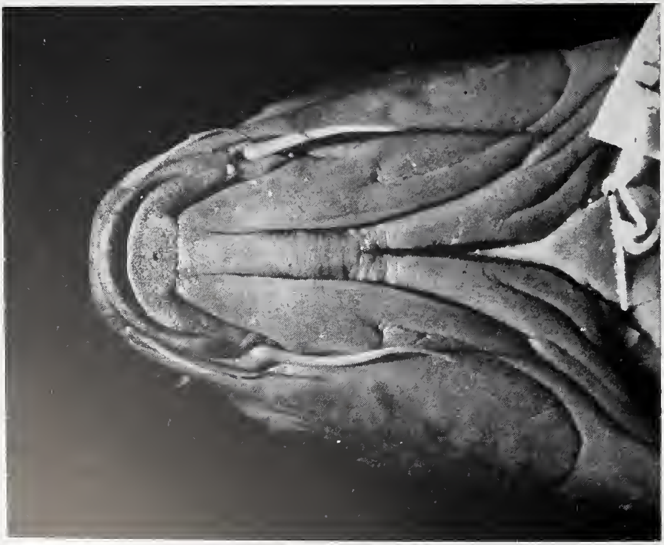

FIG. 28.—Onderkaak van *B. ho!ubi.* FIG. 28.—Lower Jaw of *B. holubi.*

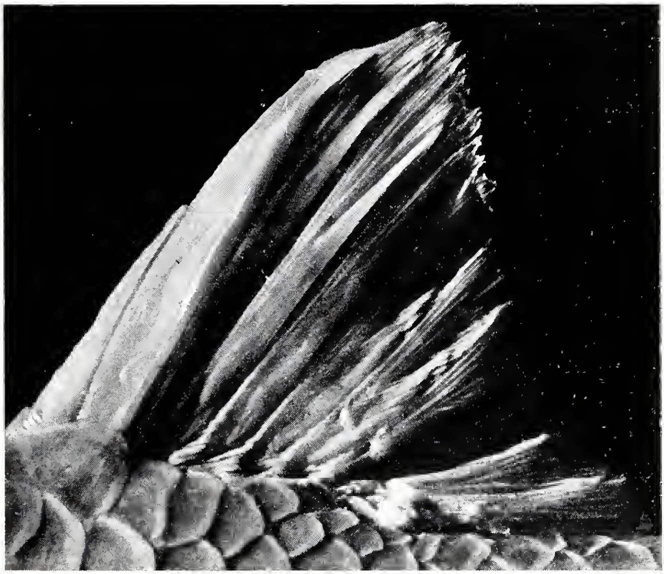

FIG. 29.—Dorsal fin of *B. holubi*. FIG. 29.—Rugvin van *B. holubi*.

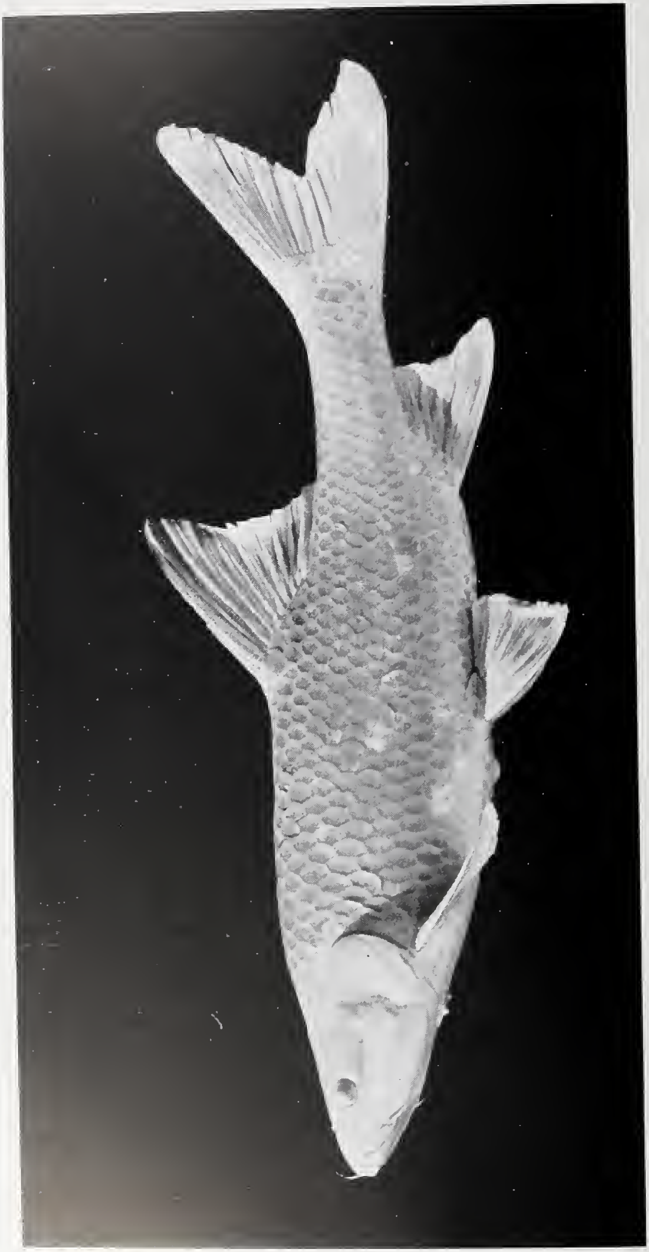

FIG. 30.—*Barbus kimberleyensis.*

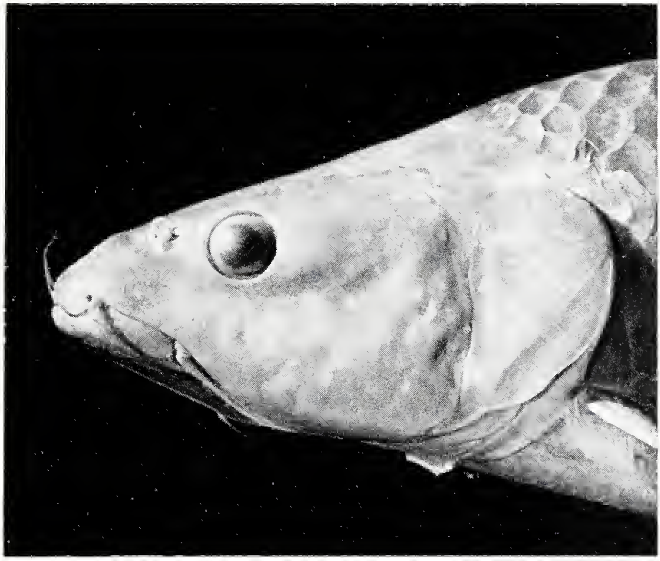

FIG. 31.—Head of *B. kimberleyensis*. FIG. 31.—Kop van *B. kimberleyensis*.

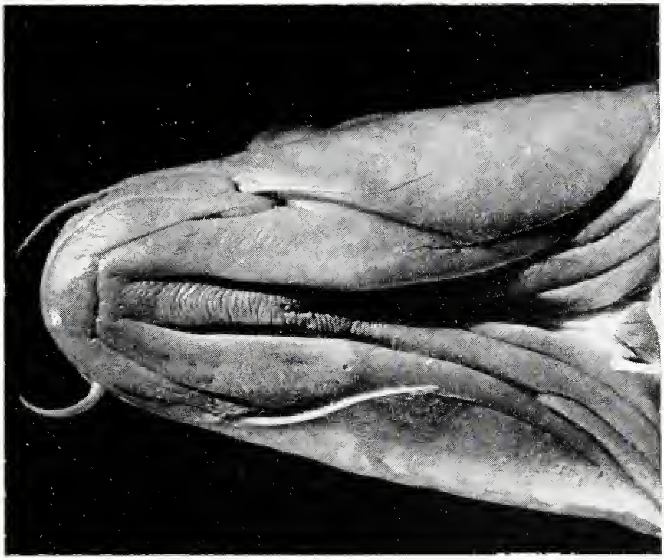

FIG. 32.—Lower Jaw of *B. kimberleyensis*. FIG. 32.—Onderkaak van *B. kimberleyensis*.

Fauna & Flora

No. 9 **TRANSVAAL** 1958

NONNETJIE-EEND *Dendrocygna viduata* WHITE-FACED DUCK

(Foto/Photo: A. A. Groenewald.)

FAUNA & FLORA

'n amptelike publikasie van die Transvaalse Provinsiale Administrasie

an official publication of the Transvaal Provincial Administration

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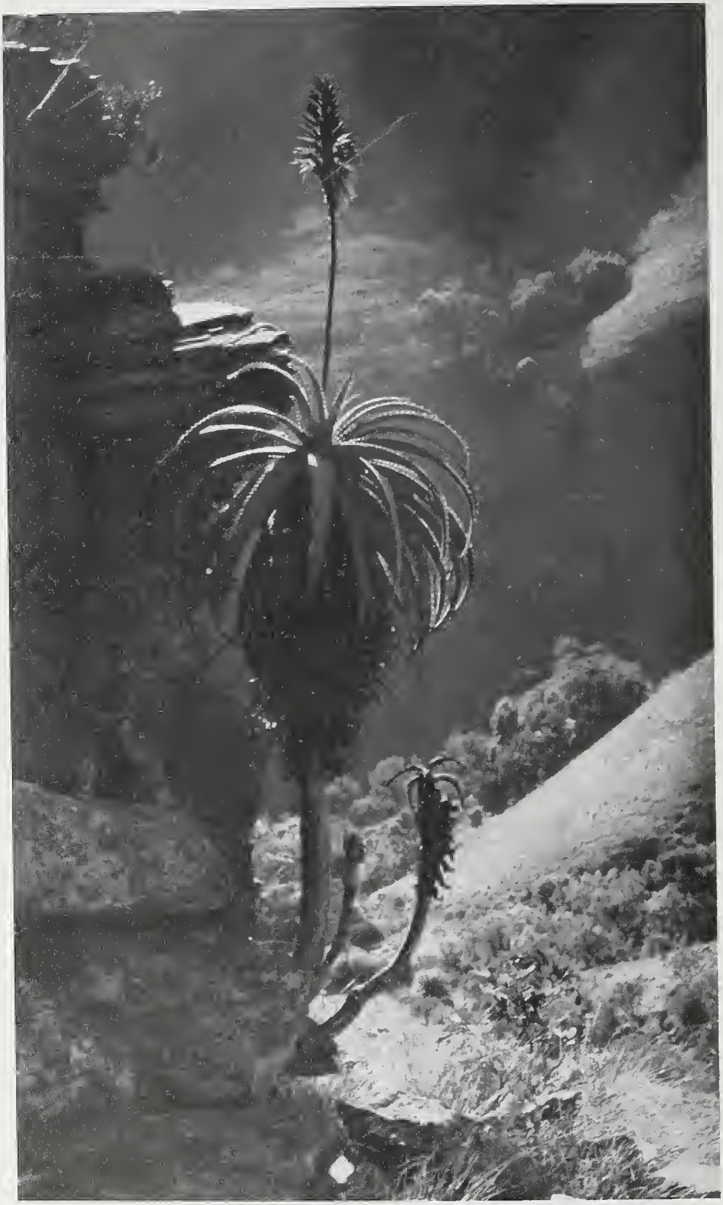

(Foto/Photo: J. v. Z. Lötz.)

Aloe arborescens

INHOUD

Bladsy

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FOTO OP BAND 4: Geel Varkoorblom (*Zantedeschia sp.*) van die Luluberge.

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PHOTO ON COVER 4: Yellow Arum Lily (*Zantedeschia sp.*) from the Lulu Mountains.

ADMINISTRASIE VAN DIE PROVINSIE VAN TRANSVAAL

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SY EDELE F. H. ODENDAAL

Provinsiale Sekretaris
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Waarnemende Direkteur van Natuurbewaring
Mnr. S. S. DU PLESSIS

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NATUURBEWARING IN TRANSVAAL

deur T. J. Steyn

Direkteur van Natuurbewaring

MET uitsondering van die Nasionale Krugerwildtuin wat onder die jurisdiksie van die Nasionale Parkeraad val, is natuurbewaring in Transvaal 'n funksie van die Afdeling Natuurbewaring van die Provinsiale Administrasie. Hoe omvattend die werksaamhede van genoemde Afdeling is blyk uit die verskeidenheid van die ordonnansies wat deur hom geadministreer word, nl. die Wild-ordonnansie, 1949, die Ordonnansie op die Beskerming van Inheemse Flora, 1940, die Samevattende Ordonnansie op Visserye, 1949, die Ordonnansie op die Uitroeiing van Ongedierte, 1949, en die Ordonnansie op Openbare Oorde, 1953.

Die huidige Afdeling het ontwikkel uit die Afdeling Fauna en Flora wat in 1947 met die benoeming van 'n Konservator van Fauna en Flora ontstaan het. Die mees fundamentele verandering wat sedert daardie benoeming plaasgevind het, is sekerlik die sentralisasie van beheer in 'n enkele kantoor in die Hoofstad. Hoewel natuurbewaarders dié toestand gewoonlik as 'n vanselfsprekende voorvereiste beskou, is dit tog vandag nog uitsonderlik, nie slegs in die Unie nie, maar selfs in die oudste lande van die wêreld.

Terselfdertyd het daar egter ook 'n sentrale Raad van Advies insake Fauna en Flora en 'n aantal Plaaslike (of Distriks-) Komitees van Advies tot stand gekom. Eersgenoemde bestaan uit 'n aantal bioloë en verteenwoordigers van ander belangegroepe onder voorsitterskap van 'n lid deur die Uitvoerende Komitee benoem, en laasgenoemde uit plaaslike wildeienaars onder voorsitterskap van die landdros van elke distrik. Die Direkteur van Natuurbewaring is *ex officio* lid van die Sentrale Adviesraad en die Inspekteur van Fauna en Flora in elke distrik het sitting in sy Plaaslike Komitee.

Hoewel beheer gesentraliseer is, is daar dus ruim voorsiening gemaak vir die verteenwoordiging van plaaslike belange. Aanbevelings van die Plaaslike Komitees word eers deur die Sentrale Adviesraad en dan deur die Uitvoerende Komitee oorweeg. Hoewel hulle die verste eindpunte van die organisasie vorm, speel die Plaaslike Komitees dus 'n uiters belangrike rol, vergelykbaar met dié van die menslike sintuie. Om voor die hand liggende redes is dit belangrik dat die landdros voorsitter en die plaaslike Inspekteur 'n lid van die Plaaslike Komitee is. Miskien is dit wenslik om die Distrikskommandant van Polisie ook daar sitting te gee.

Weens die samestelling van die plante- en dierelewe van die Provinsie, die mate van bedreiging wat elke groep ondervind en die openbare belangstelling wat daarin getoon word, is wildbewaring noodwendig die vernaamste van die Afdeling se afsonderlike bedrywighede. Dit behels hoofsaaklik—

(i) die stigting en ontwikkeling van natuurreservate, wat dikwels herbevolking insluit;

NATURE CONSERVATION IN THE TRANSVAAL

by T. J. Steyn

Director of Nature Conservation.

WITH the exception of the Kruger National Park which falls under the jurisdiction of the National Parks Board, nature conservation in the Transvaal is a function of the Nature Conservation Section of the Provincial Administration. The extent of the activities of the said Section is obvious from the diversity of ordinances administered by it, viz., the Game Ordinance, 1949, the Native Flora Protection Ordinance, 1940, the Fisheries Consolidation Ordinance, 1949, the Vermin Destruction Ordinance, 1949, and the Public Resorts Ordinance, 1953.

The present Section has developed from the Fauna and Flora Section which came into being in 1947 with the appointment of a Conservator of Fauna and Flora. The most fundamental change that has taken place since the first appointment, is certainly the centralization of control in a single office in the Capital. Although nature conservationists usually regard this condition as a self-evident prerequisite, it is, however, still the exception today, not only in the Union but even in the oldest countries of the world.

At the same time, however, a central Fauna and Flora Advisory Board and a number of Local (or District) Advisory Committees were established. The first-mentioned consists of a number of biologists and representatives of other interested groups, under the chairmanship of a member nominated by the Executive Committee, and the latter of local game owners under the chairmanship of the magistrate of each district. The Director of Nature Conservation is *ex officio* a member of the Central Advisory Board and the Inspector of Fauna and Flora in each district is a member of his Local Committee.

Although control has been centralized, ample provision has, therefore, been made for the representation of local interests. Recommendations from the Local Committees are first considered by the Central Advisory Board and then by the Executive Committee. Although they are the extremities of the whole organisation, the Local Committees, therefore, play an extremely important role, comparable with that of the human organs of sense. It is, for obvious reasons, important that the magistrate should be chairman and the Local Inspector a member of the Local Committee. It would perhaps be desirable to have the District Commandant of Police also on the Local Committee.

Due to the composition of the plant and animal life of the Province, the extent to which each group is threatened and the public interest shown therein, game preservation inevitably is the most important of the Section's separate activities. It comprises mainly—

(i) the establishment and development of nature reserves, which often includes restocking;

(ii) die bepaling van jaarlikse jagreëlings op alle gronde in die Provinsie;
(iii) die uitoefening van algemene beheer oor wild en wilde diere;
(iv) die fisiese handhawing van die bepalings van die Ordonnansie;
(v) publisiteit en propaganda; en
(vi) navorsing.

(i) DIE STIGTING EN ONTWIKKELING VAN NATUURRESERVATE.

Oor dié onderwerp alleen kan boekdele geskryf word, gevolglik laat die beskikbare ruimte slegs 'n vlugtige oorsig toe. Hoewel verskeie andere reeds gestig is, is besluit om as eerste stap vyf strategies-geleë Provinsiale reservate te ontwikkel sodat hulle onder andere ook as verspreidingsentrums kan dien.

Eerstens, die S. A. Lombard-natuurreservaat.—Dit is in die Wes-Transvaalse distrik Bloemhof geleë, beslaan 4,417 morge en is volledig omhein met 'n 8 voet hoë heining van 14 doringdrade. Voorheen was die plaas bekend as „ Panfontein ”, maar dit is onlangs vernoem na die pasafgetrede Provinsiale Sekretaris wat in 'n groot mate verantwoordelik was vir die totstandkoming van die Afdeling en vir sy beleid.

Eland op die S. A. Lombard-Natuurreservaat.
Eland on the S. A. Lombard Nature Reserve.

Die meeste van die wild is van elders ingevoer en die volgende syfers toon hoe verbasend vinnig hulle vermeerder het:—

Swartwildebeeste: 1949, 12 stuks; 1959, 55.

Rooihartbeeste: 1951, 7 stuks; 1959, 22.

(ii) the regulation of annual hunting facilities on all land in the Province;

(iii) the exercise of general control in respect of game and wild animals;

(iv) the physical enforcement of the provisions of the Ordinance;

(v) research; and

(vi) publicity and propaganda.

(i) THE ESTABLISHMENT AND DEVELOPMENT OF NATURE RESERVES.

It would be possible to write volumes on this subject, but the available space allows only a brief survey.

Although various other reserves have already been established, it has been decided, as a first step, to develop five strategically situated Provincial Reserves so that they may, *inter alia,* also serve as distribution centres.

Firstly, the S. A. Lombard Nature Reserve.—This is situated in the Western Transvaal District of Bloemhof, comprises 4,417 morgen and is completely fenced in with an 8 foot fence consisting of 14 strands of barbed wire.

This farm was previously known as " Panfontein ", but was lately renamed after the recently retired Provincial Secretary, who was to a large extent responsible for the establishment of this Section and its policy.

Most of the game were introduced from elsewhere and the following figures indicate the rapid increase in its numbers:—

Black Wildebeest: 1949, 12 head; 1959, 55.
Red Hartebeest: 1951, 7 head; 1959, 22.
Eland: 1950, 3 head; 1959, 12.
Blesbuck: 1949, 8 head; 1959, 131.
Springbuck: 1949, 120 head; 1959, 737.
Impala: 1950, 11 head; 1959, 105.

In addition to these species, duiker and steenbuck are also found there. Recently a few specimens of Gemsbuck—a donation from the National Zoological Gardens—were also released in the reserve. This is the last of the indigenous species of the arid south-western portion of the Province which will be bred in this reserve.

A separate portion of the reserve is used for the large-scale breeding and training of foxhounds which are then sold at nominal prices to vermin destruction clubs in the Province. The teams of trained hounds which have already been sold, render excellent service and the system finds great favour with the farming community. It is important to train the hounds in the presence of game, otherwise they may cause considerable damage after delivery to the clubs.

The necessary dwellings, offices, laboratory, outbuildings, kennels and hound clinics, storerooms, stables and other farm buildings have already been erected.

Elande: 1950, 3 stuks: 1959, 12.

Blesbokke. 1949, 8 stuks; 1959, 131.

Springbokke: 1949, 120 stuks; 1959, 737.

Rooibokke: 1950, 11 stuks; 1959, 105.

Behalwe hierdie soorte word daar ook duikers en steenbokke aangetref. Onlangs is een paar gemsbokke—'n geskenk van die Nasionale Dieretuin—in die reservaat losgelaat. Dit is die laaste van die inheemse soorte van die droë suidwestelike deel van die Provinsie wat in hierdie reservaat geteel sal word.

'n Afgesonderde gedeelte van die reservaat word gebruik vir die grootskaalse teel en afrigting van jakkalshonde wat dan teen nominale pryse aan ongediertebestrydingsklubs in die Provinsie verkoop word. Die spanne afgerigte honde wat reeds verkoop is, lewer goeie diens en die stelsel vind groot byval by die boeregemeenskap. Dit is belangrik om die honde tussen wild af te rig, anders kan hulle groot skade aanrig ná hulle aan klubs afgelewer is.

Die nodige woonhuise, kantore, laboratorium, buitegeboue, hondehokke en -kliniek, pakkamers, stalle en ander plaasgeboue is alles reeds opgerig.

Tweedens, word die Hans Merensky-natuurreservaat van 4,847 morge, geleë aan die Groot Letabarivier, 40 myl noord-oos van Tzaneen, genoem. In verhouding tot die S. A. Lombard-natuurreservaat is dit dus in die teenoorgestelde hoek van Transvaal geleë en is sy klimaat, en gevolglik sy plant- en dierelewe ook totaal anders.

Die reservaat is dan ook bedoel vir die beskerming van bedreigde laeveldse soorte soos basterelande, swartwitpense, basterhartbeeste, basterkoedoes, kameelperde, ens. Onder andere word die volgende soorte reeds daar aangetref: Vlakvarke, steenbokke, duikers, klipspringers, rooibokke, bosbokke, rietbokke, waterbokke, koedoes, blouwildebeeste, sebras, swartwitpense, basterhartbeeste en kameelperde.

Per oppervlakte-eenheid is hierdie reservaat ongetwyfeld reeds net so goed as die Krugerwildtuin bevolk. Dit is ook volledig omhein met 'n 8 voet hoë draadheining en die watervoorraad is aangevul met 'n hele aantal opgaardamme en 'n paar boorgate wat betreklik eweredig oor die hele gebied versprei is. Dit is juis ter herinnering aan die spontane hulp wat wyle dr. Hans Merensky in verband met watervoorsiening aan die reservaat verleen het dat die oorspronklike plaas „ Eiland " asook gedeeltes van „ Mabete ", „ Vygeboom " en „ Prieska " wat later aangekoop is, na hom vernoem is. Op die eiendom is ook 'n klein warmwaterbron wat mettertyd deur die Raad van Kuratore vir Minerale Baaie ontwikkel sal word.

Derdens word genoem die natuurskone Loskopdam-natuurreservaat van 14,891 morge wat min of meer tussen eersgenoemde twee in die middelveld van Sentraal-Transvaal geleë is, naamlik rondom die bekende besproeiingsdam Loskop, in die distrikte Witbank en Middelburg. Dit is terselfdertyd 'n welbekende hengel- en vakansieoord en daarom is die besoekersgeriewe wat op 2 Mei 1955 vir die publiek oopgestel is, ingevolge die bepalings van die Ordonnansie op Openbare Oorde deur die Administrasie opgerig.

The *second* reserve to be mentioned is the Hans Merensky Nature Reserve, in extent 4,847 morgen and situated on the Groot Letaba River, 40 miles north-east of Tzaneen. In relation to the S. A. Lombard Nature Reserve, it lies in the directly opposite corner of the Transvaal so that its climate, and consequently its plant and animal life, is totally different.

The reserve is therefore, intended for the protection of threatened Lowveld species such as roan, sable, sassaby, inyala, giraffe, etc. The following species are, amongst others, already found there: Warthog, steenbuck, duiker, klipspringer, impala, bushbuck, reedbuck, waterbuck, kudu, blue wildebeest, zebra, sable, sassaby and giraffe.

Undoubtedly this reserve is already as well populated per unit area as the Kruger Park. It has also been completely fenced in with an eight feet wire fence and the water supply has been augmented by a number of catchment dams and a few boreholes which are distributed fairly evenly over the whole area. It is actually in memory of the spontaneous assistance rendered to the reserve by the late Dr. Hans Merensky in regard to water supply, that the original farm "Eiland", together with portions of "Mabete", "Vygeboom" and "Prieska" which were subsequently acquired, has been named after him. On the property there is also a small mineral spring which will be developed in due course by the Mineral Baths Board of Trustees.

The *third* to be mentioned is the scenic Loskop Dam Nature Reserve, in extent 14,891 morgen and situated more or less halfway between the two first-mentioned reserves in the Middleveld of the Central Transvaal, namely, around the well-known irrigation dam of Loskop in the Districts of Witbank and Middelburg. It is, at the same time, a renowned fishing and holiday resort and that is why the amenities for visitors which were opened to the public on the 2nd May, 1955, were erected by the Administration in terms of the Public Resorts Ordinance.

(Photo/Foto: S. S. du Plessis).

Camping at the Loskopdam Public Resort.
Kampeerders by Loskopdam Openbare Oord.

Die hoofdoel van hierdie Ordonnansie is om die Administrasie te magtig om geriewe vir besoekers aan „oorde" soos Loskop daar te stel. Sodra toeriste in natuurreservate toegelaat word, ontstaan daar egter botsende belange en moet daar voorsiening vir behoorlike beheermaatreëls gemaak word. Die gevolg is dat die bepalings wat op natuurbewaring binne die oord te Loskop betrekking het, selfs baie strenger is as dié wat op die res van die natuurreservaat van toepassing is.

Gemeubileerde hutakkommodasie asook kampeergeriewe en motorbootritte word reeds aangebied terwyl 'n groot swembad, 'n kinderbadjie en 'n teekamer gedurende 1958 voltooi is. Die openbare oord is beperk tot 'n afgesonderde gedeelte van die reservaat en trek reeds duisende besoekers aangesien dit slegs 100 myl van Pretoria en sowat 150 myl van die Rand af geleë is.

'n Groot gedeelte van die reservaat ten weste van die dam is behoorlik omhein en van wild voorsien. Hoewel die getalle nog laag is, is die metode van besigtiging, naamlik, van 'n boot af in plaas van uit 'n motorkar, 'n interessante afwyking van die alledaagse. Die volgende soorte word reeds aangetref: Steenbokke, duikers, oorbietjies, klipspringers, bosbokke, rooibokke, rietbokke, rooiribbokke, koedoes, basterkoedoes, waterbokke, sebras, blouwildebeeste, kameelperde en seekoeie.

(Foto/Photo: T. B. Verschuur.)

Vang van Blesbokke, Percy Fyfe-Natuurreservaat.
Catching Blesbuck at the Percy Fyfe Nature Reserve.

Die *vierde* Transvaalse reservaat wat tans aktief ontwikkel word, is die Percy Fyfe-natuurreservaat van 2,932 morge, geleë aan die spoorlyn tussen Potgietersrus en Pietersburg, omtrent halfpad tussen dié twee

The main object of this Ordinance is to authorize the Administration to establish facilities for visitors to such " resorts " as Loskop. However, as soon as tourists are allowed in nature reserves, conflicting interests arise and provision has to be made for proper control measures. The result is that the provisions applicable to nature conservation within the Loskop Resort are even stricter than those that apply to the rest of the nature reserve.

Furnished bungalow accommodation, camping facilities and motor boats, are already provided whilst a large swimming bath, a paddling pool and a tea-room were completed in 1958. The public resort is limited to a secluded portion of the reserve and already attracts thousands of visitors since it is situated only 100 miles from Pretoria and approximately 150 miles from the Rand.

A large portion of the reserve to the west of the dam has been properly fenced in and stocked with game. Although the numbers are still small, the method of viewing the game, namely, from a boat instead of from a motor car, offers an interesting departure from the ordinary. The following species are already found in the reserve: Steenbuck, duiker, oribi, klipspringer, bushbuck, impala, reedbuck, red rhebuck, kudu, inyala, waterbuck, zebra, blue wildebeest, giraffe and hippopotamus.

The *fourth* Transvaal reserve which is being actively developed at present, is the Percy Fyfe Nature Reserve of 2,932 morgen, situated on the railway line between Potgietersrus and Pietersburg, approximately halfway between these two towns. This farm, previously known as " Lunsklip ", has developed into the show farm of that vicinity during the past 30 years as a result of the conservation farming of Mr. Percy Fyfe. A characteristic feature of this reserve is a series of 30 dams thrown across a dry river bed to impound abundant water where previously no permanent water existed. Furthermore, the farm is covered with beautiful indigenous trees today, although originally it was a barren Bantu location. The most noteworthy characteristic is, however, a beautiful herd of approximately 800 blesbuck, the progeny of five head originally introduced from the Free State by Mr. Fyfe.

Because it was unthinkable to the childless Fyfe couple that the farm could possibly lapse into its former state after their death, they donated it to the Administration as a nature reserve in 1953. Since then the blesbuck enclosure as well as the rest of the farm have been provided with a proper game fence and the following species have been released in the unpopulated area: Impala, bushbuck, kudu, grey rhebuck, blue wildebeest and zebra. In the meantime a trapping paddock has been erected in the blesbuck enclosure and some of these antelope are distributed amongst interested farmers annually. Heavy machinery for soil conservation purposes has been acquired in order that Mr. Fyfe's good work may be continued by the farm foreman.

The *fifth* and last Transvaal nature reserve mentioned here is Barberspan, near Delareyville, in the Western Transvaal. It differs totally from the others in that it is almost exclusively a sanctuary for waterfowl. In summer time this pan and its surrounding area of approximately 4,233 morgen, is the home of thousands of birds and in the winter the moulting place of tens of thousands. It will, therefore, be realized why the riparian owners approached the Administration to have the area proclaimed and developed as a reserve. Apart from the birds it is also the home of the golden Transvaal yellowfish and thousands of anglers annually exercise their sport in this pan.

dorpe. Hierdie plaas, voorheen bekend as „Lunsklip", het gedurende die afgelope 30 jaar as gevolg van die bewaringsbeleid van mnr. Percy Fyfe tot die pragplaas van daardie omgewing ontwikkel. 'n Kenmerk van die plaas is 'n serie van 30 damme wat in 'n droë spruit gebou is. Verder is dit vandag oortrek van pragtige inheemse bome hoewel dit aanvanklik 'n kaal Bantoelokasie was. Die opvallendste is egter 'n pragtige trop van ongeveer 800 blesbokke, die nasate van 5 stuks wat oorspronklik deur mnr. Fyfe uit die Vrystaat ingevoer is.

Omdat dit vir die kinderlose Fyfe-egpaar ondenkbaar was dat die plaas moontlik ná hul dood tot sy vorige toestand sou verval, het hulle dit 'n paar jaar gelede as natuurreservaat aan die Administrasie geskenk. Sedertdien is die blesbokkamp asook die res van die plaas afsonderlik van behoorlike wildheinings voorsien en is rooibokke, bosbokke, koedoes, vaalribboke, blouwildebeeste en sebras in die onbevolkte gedeelte losgelaat. Intussen is ook 'n vangkamp in die blesbokkamp gebou en jaarliks word van die bokke onder belangstellende boere versprei. Swaar masjinerie vir grondbewaringswerk is aangeskaf sodat mnr. Fyfe se goeie arbeid deur die plaasvoorman voortgesit kan word.

Die *vyfde* en laaste Transvaalse natuurreservaat wat hier genoem word, is Barberspan naby Delareyville in Wes-Transvaal. Dit verskil geheel-en-al van die ander deurdat dit feitlik uitsluitlik 'n toevlugsoord vir watervoëls is. Die pan en omliggende gebied van ongeveer 4,233 morge is in die somer die tuiste van duisende voëls en in die winter die verveerplek van tienduisende. Dit is dus te verstane dat die oewereienaars die Administrasie genader het om dit tot reservaat te proklameer en te ontwikkel. Afgesien van die voëls is dit ook die tuiste van die goudgeel Transvaalse Geelvis en duisende hengelaars beoefen elke jaar hul sport in hierdie pan.

Gedurende 1951 het die Administrasie 389 morge van die oewergrond aangekoop en woongeriewe vir die plaaslike Inspekteur van Fauna en Flora asook vir die Voëlkundige, wat gedurende 1955 benoem is, opgerig. 'n Tydelike Tegniese Assistent is gedurende Desember 1958 aangestel om die Voëlkundige behulpsaam te wees. 'n Klein laboratorium word tans gebou en sal teen die end van die jaar in gebruik geneem kan word. Die Voëlkundige lê hom hoofsaaklik toe op bevolkingstudies en die beringing van trekvoëls sodat hierdie reservaat ongetwyfeld binnekort een van die vernaamste sentrums in Afrika vir die studie van die trekgewoontes by voëls sal word.

Behalwe genoemde vyf natuurreservate wat tans aktief deur die Administrasie ontwikkel word, is daar 155 ander gebiede wat behoort aan die Provinsie, Staatsdepartemente, munisipaliteite en private persone in Transvaal en wat op versoek van die eienaars tot natuurreservate geproklameer is. Die totale oppervlakte van al hierdie reservate (die reeds genoemde vyf ingesluit maar die Krugerwildtuin uitgesluit) is meer as 520,000 morge. 'n Verdere aantal word eersdaags geproklameer terwyl nuwe aansoeke nog gedurig van boere ontvang word.

Die vernaamste voordeel verbonde aan sodanige proklamasie is dat 'n minimum boete van £100 vir enige oortreding van die Ordonnansie van toepassing word.

During 1951 the Administration purchased 389 morgen of riparian ground and erected housing facilities for the local Inspector of Fauna and Flora and also for the Ornithologist who was appointed in 1955. A Temporary Technical Assistant was appointed in December, 1958, to assist the Ornithologist. A small laboratory is at present being built and will be ready for use at the end of the year. The Ornithologist devotes his time mainly to population studies and the ringing of migratory birds so that undoubtedly, this reserve will shortly become one of the main centres in Africa for the study of bird migration.

In addition to the above-mentioned five nature reserves at present being actively developed by the Administration, there are 155 other areas belonging to the Province, Government Departments, municipalities and private persons in the Transvaal, which have been proclaimed nature reserves at the request of the owners. The total area of all these reserves (including the five already mentioned but excluding the Kruger National Park) comprises more than 520,000 morgen (1,092,000 acres). A further number will be proclaimed shortly whilst new applications are constantly being received from farmers.

The main advantage attached to such proclamation is that a minimum fine of £100 for any contravention of the Ordinance becomes applicable.

(Photo/Foto: A. A. Groenewald.)

Grey-headed Gulls. Gryskopmeeus.

Hydrocoloeus cirrhocephalus.

(ii) THE REGULATION OF ANNUAL HUNTING FACILITIES ON ALL LAND IN THE PROVINCE.

The duration of the hunting season is determined annually. Usually it is from 15th May to 15th August. This period is obviously not equally suitable for all species of game—birds included—but it is preferred for various practical reasons. This alone is a subject which could be discussed at length.

(ii) DIE BEPALING VAN JAARLIKSE JAGREËLINGS OP ALLE GROND IN DIE PROVINSIE.

Die duur van die jagseisoen word jaarliks bepaal. Dit is gewoonlik vanaf 15 Mei tot 15 Augustus. Hierdie periode is klaarblyklik nie ewe geskik of ongeskik vir alle wildsoorte—voëls ingesluit—nie, maar word om verskeie praktiese redes verkies. Ook dit alleen is 'n onderwerp waaroor baie geredeneer kan word.

Jaarliks word sekere wildsoorte in bepaalde distrikte of selfs op besondere plase wat genoem word, vir die grondeienaars tot „oopwild" verklaar. In sulke gevalle kan die betrokke eienaars vryelik en sonder enige permit die jag maak op sodanige wild gedurende die voorgeskrewe periode. Die doel van hierdie „oopverklaring" kan waarskynlik die beste deur 'n paar voorbeelde, met die beweegrede in elke geval, toegelig word:—

(1) Hase, oop verklaar vir eienaars dwarsdeur die Transvaal. Rede: Omdat hulle so volop is.

(2) Blesbokke en springbokke, oop verklaar vir eienaars in sekere hoëveldse distrikte. Rede: Om die gevoel van die eiendomsreg tuis te bring by die boer wat dié wildsoorte nog op sy omheinde plaas het juis omdat hy hulle beskerm en hulle daar wil hê.

(3) Wildemakoue, oop verklaar vir eienaars in Delareyville. Rede: Op aandrang van die boeregemeenskap wat skade ly as gevolg van strooptogte van voëls wat op Barberspan beskerm word.

Soms word wild vir eienaars oop verklaar in 'n gebied uitgesonderd sekere plase. Dit word gewoonlik gedoen as strafmaatreëls teen daardie eienaars wat oop-verklaring of ander voorregte voorheen misbruik het.

As die teenoorgestelde van „oopwild" kan „beskermde wild" genoem word, d.w.s. skaars wild wat as „beskerm" geproklameer is en waarop slegs onder buitengewone omstandighede jag gemaak mag word.

Tussen dié twee groepe ressorteer die grootste aantal soorte wat gewoonlik „toewild" genoem word, d.w.s. soorte waarvan op elke plaas slegs bepaalde getalle onder dekking van 'n permit geskiet mag word. Op die permit verskyn onder andere die naam van die houer, wildsoorte en getalle wat geskiet mag word, geldigheidsduur van die permit, ens. Hierdie „kwotas" word hoofsaaklik op aanbeveling van die Plaaslike Komitees in oorleg met die betrokke Inspekteurs aan die eienaars toegeken. Sover moontlik word hulle gebaseer op die soorte en getalle wild wat werklik op die plase aanwesig is, soos bepaal deur die Inspekteurs wat jaarliks onder leiding van 'n Vakkundige Beampte 'n wildopname doen.

(iii) DIE UITOEFENING VAN ALGEMENE BEHEER OOR WILD EN WILDE DIERE.

Kortliks behels dit die uitreiking, terugtrekking of weiering van jagpermitte en permitte om wild, wilde voëls en sekere ander wilde diere te vang, te vervoer, in gevangenskap aan te hou, te verhandel en in- of uit te voer.

Annually certain species of game are declared "open game" to landowners in specified districts or even on individual farms. The owners concerned may hunt such game freely and without any permit during the prescribed period. The object of declaring game "open" like this can best be explained by way of a few examples with the reasons in each case:—

(1) Hares, declared open to owners throughout the Transvaal. Reason: Because they are so numerous.

(2) Blesbuck and springbuck, declared open to owners in certain Highveld districts. Reason: To encourage the sense of ownership in the farmer who still has these species of game on his fenced farm only because he protects them and wants to have them there.

(3) Spurwing geese, declared open to owners in Delareyville. Reason: At the request of the farming community who suffer damage as a result of raids by birds protected at Barberspan.

Sometimes game is declared open to owners in an area *excluding* certain farms. This is usually done as a punitive measure against those owners who have previously misused the "open season" or other privileges.

As opposed to "open game", mention may be made of "protected game", i.e. rare game which is proclaimed "protected" and which may be hunted only under exceptional circumstances.

Between these two groups we have the largest number of species which are usually referred to as "closed game", i.e. species of which only specified numbers may be hunted on each farm under cover of a permit. On the permit appears, *inter alia*, the name of the holder, species and numbers of game that may be hunted, the duration of the permit, etc. These "quotas" are allocated to the owners mainly on the recommendation of the local committees in consultation with the Inspectors concerned. They are based, as far as possible, on the species and numbers of game actually present on the farms, as determined by the Inspectors who annually conduct a game survey under the guidance of a Professional Officer.

(iii) THE EXERCISE OF GENERAL CONTROL IN RESPECT OF GAME AND WILD ANIMALS.

This briefly entails the issue, withdrawal or refusal of hunting permits and permits to catch, transport, keep in captivity, sell, export or import game, wild birds and certain other species of animals.

(iv) THE PHYSICAL ENFORCEMENT OF THE PROVISIONS OF THE ORDINANCE.

This is carried out by 16 European Inspectors of Fauna and Flora, 32 Native Rangers and approximately 355 Honorary Game Officers in collaboration with the S.A. Police.

(iv) DIE FISIESE HANDHAWING VAN DIE BEPALINGS VAN DIE ORDONNANSIE.

Dit word gedoen deur 16 Blanke Inspekteurs van Fauna en Flora, 32 Naturelle-veldwagters en ongeveer 355 Ere-wildbeamptes in samewerking met die S.A. Polisie.

(v) PUBLISITEIT EN PROPAGANDA.

Ook hieraan word weens 'n personeeltekort eintlik veels te min gedoen. Die amptelike bulletin „ Fauna en Flora " word jaarliks gepubliseer, waar moontlik word boere-organisasies en ander liggame toegespreek, persberigte en radiopraatjies gelewer en uitstallings gereël, maar die benoeming van 'n voltydse publisiteitsbeampte skyn die enigste oplossing te wees. Voorbereidingswerk in dié verband is reeds gedoen.

(vi) NAVORSING.

Die Afdeling besef terdeë dat sy bewaringswerk slegs kan slaag as dit op wetenskaplike gegewens berus. Hierdie gegewens is in baie gevalle nie beskikbaar nie en daarom is die Afdeling verplig om self navorsing te onderneem. Omdat onlangs eers daarin geslaag is om een pos vir wildnavorsing te skep en te vul, is navorsing in hierdie onderafdeling nog in 'n beginstadium.

(Foto/Photo: S. S. du Plessis.)

Hartbeespoort Visserye. Hartbeespoort Fisheries.

BINNELANDSE VISSERYE IN TRANSVAAL.

Die Visseryonderafdeling, met sy hoofkwartier te Lydenburg, is ongetwyfeld die verste ontwikkel, nie alleen omdat dit die oudste is nie maar ook aangesien dit van die begin af die volle ondersteuning van die Transvaalse Hengelaarsunie en die 60,000 gelisensieerde hengelaars van die

(v) RESEARCH.

The Section is fully aware of the fact that its conservation work can only be successful if it is based on scientific data. In many cases these data are not available and the Section is compelled, therefore, to carry out its own research. Research in this sub-division is still in its initial stage because it has only recently been possible to create and fill a single post for game research.

(vi) PUBLICITY AND PROPAGANDA.

This also receives too little attention really, due to a shortage of staff. The official bulletin "Fauna and Flora" is published annually, farmers' organizations and other bodies are addressed whenever possible, radio talks and press reports are delivered and exhibitions are arranged, but the only solution seems to lie in the appointment of a full-time Publicity Officer. Preparatory work in this connection has already been done.

INLAND FISHERIES IN THE TRANSVAAL.

The Fisheries sub-division with its headquarters at Lydenburg is undoubtedly the most advanced, not only because it is the oldest but also because it has received the full support of the Transvaal Anglers' Union and the 60,000 licensed anglers of the Province right from the start. In contrast to this, some of the other sub-divisions, e.g. game preservation, still experience serious opposition from the public quite frequently.

Of the Provincial Fisheries Institute at Lydenburg, Dr. Hey (Cape Director of Nature Conservation) said during the opening of the permanent buildings on the 3rd May, 1955, that on a recent tour of similar institutions in England and Western Europe he saw no cold-water hatchery and research centre comparable with it. The buildings comprise administrative offices, a library, laboratories, a fresh-water aquarium and conference hall, a hatching-house for trout, out-buildings, etc., whereas 86 earthern and cement ponds are used to culture various species of fish.

Research work of a high standard in connection with classification and biology of indigenous species, as also the general management of angling waters, has already been carried out.

A Lowveld Fisheries Research Station coupled with experimental Tilapia farming in the vicinity of Marble Hall was completed in 1957. The total water surface is already more than twice that of Lydenburg and the economic value of this project is regarded as far-reaching, especially in view of the fact that four private undertakings have already commenced fish-farming in the Transvaal.

Thirdly, a small fisheries station has been built directly below the wall of the Hartbeespoort Dam. This serves mainly as a distribution centre for Southern and Western Transvaal waters.

Regarding Inland Fisheries, the Transvaal policy is to concentrate on indigenous species as far as possible. In this respect the Province is fortunate in having a variety of indigenous species with considerable sporting and table values.

Fortunately Trout holds no actual threat to indigenous species as it is confined mainly to the cold mountain streams which carry no indigenous fish population worth mentioning. True enough, most of our best fishing waters already contain exotic species such as Carp, which are regarded as a pest elsewhere but which has not yet become one here. Admittedly, it

Provinsie geniet het. In teenstelling daarmee ondervind sommige van die ander onderafdelings, bv., wildbewaring, nog dikwels heftige teenstand van die publiek.

Wat die Provinsiale Visseryinstituut te Lydenburg betref, het dr. Hey (Kaapse Direkteur van Natuurbewaring) tydens die opening van die permanente geboue op 3 Mei 1955, verklaar dat hy op 'n onlangse toer van soortgelyke inrigtings in Engeland en Wes-Europa geen kouwatervisteelstasie en -navorsingsentrum gesien het wat daarmee vergelyk kan word nie. Die geboue behels administratiewe kantore, 'n biblioteek, laboratoria, 'n varswaterakwarium en konferensiesaal, 'n broeihuis vir forelle, buitegeboue, ens., terwyl 86 grond- en sementdamme van verskillende groottes gebruik word vir die teelt van verskeie vissoorte. Navorsingswerk van hoë gehalte in verband met die klassifikasie en biologie van inheemse soorte asook die algemene beheer van hengelwaters is reeds gelewer.

'n Laeveldse Visserynavorsingstasie, gepaard met 'n eksperimentele kurperboerdery, in die omgewing van Marble Hall is in 1957 voltooi. Die totale wateroppervlakte is reeds meer as tweekeer dié van Lydenburg en die ekonomiese betekenis van hierdie onderneming word as verreikend beskou, veral met die oog daarop dat vier privaat ondernemings al met kommersiële visboerdery in Transvaal begin het.

Derdens is 'n klein visteelstasie reg onderkant die wal van Hartbeespoortdam gebou. Dit dien hoofsaaklik as verspreidingsentrum vir Suid- en Wes-Transvaalse waters.

Wat binnelandse visserye betref, is die Transvaalse beleid om sover moontlik op inheemse soorte te konsentreer. In dié opsig is die Provinsie gelukkig om 'n verskeidenheid inheemse soorte met groot sport- en tafelwaarde te besit.

Forelle vorm gelukkig geen werklike bedreiging vir inheemse soorte nie aangesien hulle hoofsaaklik beperk is tot koue bergstrome wat geen noemenswaardige inheemse visbevolking dra nie. Weliswaar bevat die meeste van ons beste viswaters reeds lankal uitheemse soorte soos karp wat elders as 'n pes beskou word maar wat dit hier nog nie is nie. Dit is wel moontlik dat hulle in die toekoms nog groot skade kan aanrig, maar daar is ook goeie rede om te glo dat hulle nie teen die lewenskragtigheid van inheemse soorte soos kurpers, geelvis, barbers en makriele bestand is nie.

Waterbesoedeling vorm waarskynlik die grootste enkele bedreiging vir binnelandse visserye. Hopelik sal hierdie euwel suksesvol bekamp kan word met behulp van die Waterwet (No. 54 van 1956) en wetenskaplikes van die Afdeling wat reeds deur die Nasionale Instituut vir Waternavorsing van die W.N.N.R. met die oog op daardie Wet opgelei word.

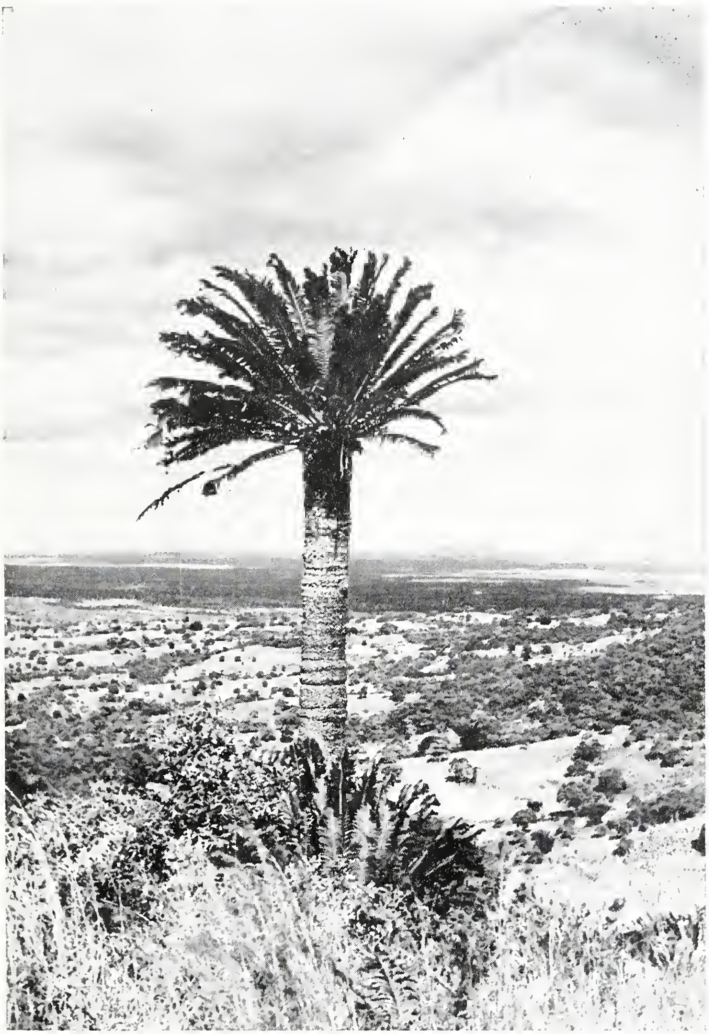
Die algemene beheer oor visserye en die fisiese handhawing van die Ordonnansie geskied op dieselfde manier as in die geval van wild. Die Transvaalse Hengelaarsunie en die Suid-Transvaalse Hengel- en Vergooibond is waardevolle bondgenote wat bewaringswerk betref en meer as 600 lede van geaffilieerde klubs is op aanbeveling van hierdie liggame tot Ere-visserybeamptes benoem.

FLORA.

Die bedreiging wat inheemse flora tot dusver in Transvaal ondervind het, is minimaal in vergelyking met die toestand in, bv., die Westelike Provinsie. Tog was dit reeds nodig om groepe soos swaardlelies (*Gladiolus*

is possible that they may still cause considerable damage in future, but there is also every reason to believe that they will not be able to stand up against the virility of indigenous species such as Barbus, Tilapia, Clarias and Eutropius.

(Photo/Foto: S. S. du Plessis.)



Mojadje cycad near Duiwelskloof, N. Transvaal.
Mojadje-palm naby Duiwelskloof, N. Transvaal.

Encephalartos transvenosus.

spp.), aalwyne (*Aloe* spp.), Barbertonse madeliefies (*Gerbera* spp.), verskeie vetplante (*Ceropegia, Caralluma, Huernia, Stapelia* spp., ens.), boomvarings (*Cyathea* en *Hemitelia* spp.), broodbome (*Encephalartos* spp.), nerinas (*Nerine* spp.), pypies (*Watsonia* spp.), varkblomme (*Zantedeschia* spp.), vuurpyle (*Kniphofia* spp.), ens., op die beskermde lys te plaas.

Die nuutste geval waarin optrede noodsaaklik was, was dié van die olifantsvoet (*Dioscorea* spp.) wat grootskaals vir die voorbereiding van kortisoon uitgehaal word. Sedert Januarie 1954 word hierdie bedrywighede beheer.

Die toestand in verband met verskeie Transvaalse houtsoorte word egter ook sorgwekkend en sal binnekort in oënskou geneem moet word.

Ná die benoeming van 'n voltydse Tuinier in die afdeling is reeds aansienlik vordering gemaak met die aanleg van inheemse tuine te Loskop en Lydenburg. Op albei plekke is kwekerye aangelê en die bedoeling is om die aanplanting van inheemse bome, struike en blomme geleidelik na ander substasies uit te brei.

ONGEDIERTEBESTRYDING.

Wat ongediertebestryding betref, het Transvaal die voortou in die Unie geneem deur die verderflike beloningstelsel af te skaf en ten minste een dier wat voorheen as „ ongedierte " geklassifiseer was, op die lys van „ beskermde wild " te plaas, nl., die aardwolf (*Proteles cristatus*). Tans is daar net twee diere naamlik die rooijakkals (*Thos mesomelas*) en die wildehond (*Lycaon pictus*) wat dwarsdeur die Transvaal tot ongedierte verklaar is en twee, naamlik die bobbejaan (*Papeo ursinus*) en die blouaap (*Cercopithecus pygerythrus*), wat in 'n paar distrikte tot ongedierte verklaar is.

In plek van die beloningstelsel het die Provinsie 'n program aanvaar bestaande uit—

(*a*) navorsing in verband met ongedierte en ongediertebestryding;
(*b*) die teel en afrigting van jakkalshonde wat teen nominale pryse aan geregistreerde klubs verkoop word;
(*c*) die gratis opleiding van jagters; en

(Foto/Photo: T. J. Steyn.)

Boere gereed vir 'n groot jakkalsjag, Wolmaransstad.
Farmers ready for a big jackal hunt, Wolmaransstad.

At present water pollution is the gravest individual threat to Inland Fisheries. It is hoped that this evil will be combated successfully with the aid of the Water Act (No. 54 of 1956), and scientists of this section, who are already being trained by the National Institute for Water Research of the C.S.I.R. with a view to the implementation of this Act.

General control in respect of fisheries and the physical enforcement of the Ordinance are carried out in the same manner as in the case of game. The Transvaal Anglers' Union and the Southern Transvaal Angling and Casting Union are valuable allies as far as conservation work is concerned and more than 600 members of affiliated clubs have been appointed honorary fisheries officers, on the recommendation of these bodies.

FLORA.

The threat to indigenous flora thus far experienced in the Transvaal is negligible in comparison with the position in the Western Province for example. Nevertheless, it has already become necessary to place groups such as the following on the list of protected plants: Gladioli (*Gladiolus* spp.), Aloes (*Aloe* spp.), Barberton Daisies (*Gerbera* spp.), several Stapeliads (*Ceropegia, Caralluma, Huernia, Stapelia* spp., etc.), Tree Ferns (*Cyatha* and *Hemitelia* spp.), Cycads (*Encephalartos* spp.) Nerinas (*Nerine* spp.), Watsonias (*Watsonia* spp.), Arums (*Zantedeschia* spp.), and Red Hot Pokers (*Kniphofia* spp.).

The most recent case in which action was necessary, was that of elephant's foot (*Dioscorea* spp.) which was uprooted on a large scale for the manufacture of cortisone. These activities have been controlled since January, 1954.

The position in connection with various Transvaal timber trees is now becoming alarming and will have to be reviewed in the near future.

After the appointment of a full-time gardener in the Section, considerable progress has been made at Loskop and Lydenburg with the laying out of indigenous gardens. Nurseries have been started at both these places and the intention is to extend the planting of indigenous trees, shrubs and flowers gradually to the other sub-stations.

VERMIN DESTRUCTION.

As far as vermin destruction is concerned, the Transvaal has taken the lead in the Union by abolishing the baleful bounty system and by placing at least one animal which was previously classified as " vermin ", on the list of " protected game ", namely the aardwolf (*Proteles cristatus*).

At the moment there are only two animals, namely the blackbacked jackal (*Thos mesomelas*) and the Cape hunting dog (*Lycaon pictus*), which have been proclaimed vermin throughout the Transvaal and two, namely the chacma baboon (*Papeo ursinus*) and the vervet monkey (*Cercopithecus pygerythrus*), which have been proclaimed vermin in a few districts.

Instead of the reward system the Province has accepted a programme consisting of—

(*a*) research in connection with vermin and vermin destruction,
(*b*) the breeding and training of foxhounds which are sold at nominal fees to registered clubs,
(*c*) the free training of huntsmen, and

(*d*) die betaling van 'n hulptoelae aan die Federale Ongediertebestrydingsvereniging van Transvaal wat sy eie voltydse organiseerder benoem het en ook 'n span afgerigte honde aanhou wat saam met 'n jagter verhuur word aan klubs wat nie hulle eie spanne honde kan bekostig nie.

OPSOMMING.

Die Afdeling Natuurbewaring van Transvaal het ongetwyfeld in die kort tydperk van twaalf jaar indrukwekkende prestasies behaal. Die toestand was egter in 1947 (en is vandag nog) só sorgwekkend, veral wat skaars wildsoorte betref, dat daar hoegenaamd geen rede is om selfvoldaan te voel nie.

Wat is nou werklik bereik en wat moet nog gedoen word? Klein teelkerne van skaars soorte is met fisiese geweld—hoe vernuftig ook al uitgevoer—gevang, vervoer en agter doringdraad geplaas waar hulle teen sigbare vyande beskerm word. In 'n paar gevalle was dit die laaste oorblyfsels van die soorte binne die Provinsie en dit is moontlik dat selfs die getalle van daardie oorblyfsels tot onderkant die gevaarpunt vir die betrokke soorte gedaal het vóór die vangste gemaak is. In die geval van bastergemsbokke, bv., moet 'n teelkern reeds *buite die Unie* gesoek word.

Ongelukkig is dit vandag nog die algemene mening in Suid-Afrika dat wildbewaring met die plasing van 'n suksesvolle teelkern agter 'n ystergordyn eindig; of liewer, dat wildbewaring daarmee volmaak en in saligheid volbring is. In dié verband is dit miskien nie onvanpas om aan te haal wat Aldo Leopold reeds in 1948 in verband met wildbewaring in Amerika geskrywe het nie:—

> „The history of game administration in this country clearly shows that it follows the same basic sequence of ideas already described in Chapter I. The successive stages of progress are:—
>
> (1) Policing the remnants of the virgin game crop.
> (2) Undertaking game farming (artificial replenishment).
> (3) Acquiring state lands and managing them.
> (4) Starting educational work.
> (5) Starting fact-finding work after learning that the requisite facts for 2, 3 and 4 do not exist.
> (6) Starting to encourage private management. Regulating private management in the public interest.
>
> Some of our states have just entered stage 2. Others have reached stage 5. None has as yet seriously entered upon stage 6."

Wat in 1948 waar was van wildbewaring in Amerika is sekerlik in 1959 nog waar van wildbewaring in Suid-Afrika, insluitende Transvaal.

My bedoeling is nie om op 'n pessimistiese trant af te sluit nie, maar om daarop te wys dat daar tot dusver slegs daarin geslaag is om die fisiese voorvereistes of tasbare middele daar te stel sodat met natuurbewaring, gebaseer op wetenskaplike feite, *begin* kan word. In die geval van binnelandse visserye het ons Leopold se sesde stadium waarskynlik pas bereik maar wat wildbewaring betref, is ons nog baie ver daarvandaan. Om die beoogde doelwit te bereik, het die Afdeling liefs méér maar *minstens dieselfde* ondersteuning as in die verlede nodig.

(*d*) the payment of a grant-in-aid to the Federal Vermin Destruction Association of the Transvaal, which appoints its own full-time organizer and which also maintains a pack of trained hounds which is let, together with a huntsman, to those clubs which cannot afford their own packs of hounds.

SUMMARY.

The Nature Conservation Section of the Transvaal has, undoubtedly, achieved a good deal within the short period of twelve years. The position was, however, so precarious in 1947 (and still is today) especially as far as rare game species were concerned, that there is no room for self-complacency.

What has in fact been achieved and what remains to be done? With physical violence—no matter how skilfully carried out—small nuclei of scarce species have been caught, transported and placed behind wire fences where they are being protected against visible enemies. In a few cases they were the remnants of the respective species in the Province and it is possible that even the numbers of these remnants had already decreased to below the critical point for the species concerned before the catches were made. In the case of roan antelope, for example, a breeding nucleus already has to be sought *outside the Union.*

Unfortunately it is still the general opinion in South Africa today that game conservation ends with the placing of a successful breeding nucleus behind an iron curtain, or rather, that game conservation thereby has been fulfilled in bliss. In this connection it is perhaps not out of place to quote what Aldo Leopold wrote as early as 1948 in connection with game conservation in America:—

> "The history of game administration in this country clearly shows that it follows the same basic sequence of ideas described in Chapter I. The successive stages of progress are:—
>
> (1) Policing the remnants of the virgin game crop.
> (2) Undertaking game farming (artificial replenishment).
> (3) Acquiring state lands and managing them.
> (4) Starting educational work.
> (5) Starting fact-finding work after learning that the requisite facts for 2, 3 and 4 do not exist.
> (6) Starting to encourage private management. Regulating private management in the public interest.
>
> Some of our states have just entered stage 2. Others have reached stage 5. None has as yet seriously entered upon stage 6."

What was true of game conservation in America in 1948 is certainly still true of game conservation in South Africa, including the Transvaal, in 1959.

I do not wish to conclude on a pessimistic note but I would like to point out that thus far only the physical prerequisites or tangible means have been established with which Nature Conservation, based on scientific facts, can be started. In the case of Inland Fisheries we have probably just reached Leopold's sixth stage but, as far as game conservation is concerned, we are still way behind. In order to achieve the aim envisaged, the Section requires preferably more than, but *at least the same* support as in the past.

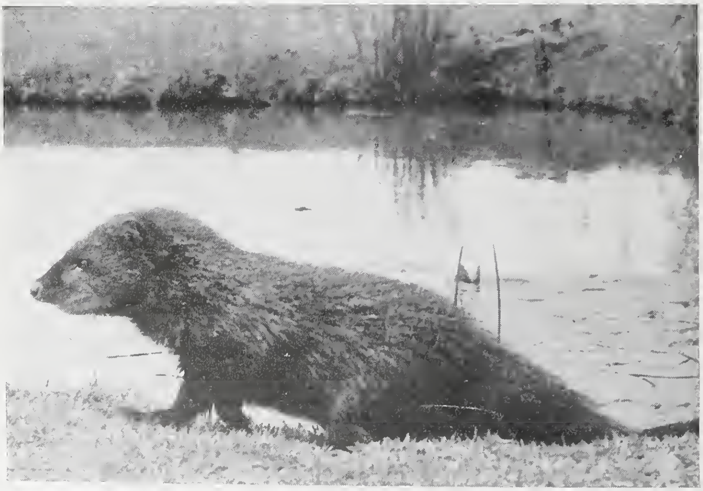
DIE WATERMUISHOND
Atilax Paludinosus

deur dr. G. L. Lombard

EEN van ons onbekendste roofdiertjies is die water- of kommetjiegatmuishond (*Atilax paludinosus*). Hierdie sku dier wat meesal in die digte oewerplantegroei van standhoudende riviere woon, word baie selde gesien. Hoewel dit ongewoon is, vind mens hulle ook in die droër dele van die land tussen los rotse en in klipskeure van koppies en rante. Verhale van hulle vernielende aanvalle op hoenderhokke en die vernietiging van pluimvee word grootliks oordryf en is die oorsaak daarvan dat hulle getalle onrusbarend afgeneem het. Hulle deugde is egter soveel meer as hulle foute dat 'n pleidooi vir hulle beskerming nie ongeregverdig sou wees nie.

Die watermuishond, hoewel hy as 'n nagdier beskou word, blyk tussen laat namiddag en die aand, en dan weer van die vroeë oggend totdat die son begin warm word, op sy aktiefste te wees. Hulle word egter ook soms helder oordag gesien waar hulle besig is om kos te soek. Hoewel hulle oor die algemeen alleenlopend is, kom hulle ook in klein gesinsgroepe voor.

(Foto/Photo,: S. S. du Plessis.)



Watermuishond. *Atilax paludinosus.* Water Mongoose.

THE WATER MONGOOSE

Atilax Paludinosus

by Dr. G. L. Lombard

ONE of our least known small carnivores is the water mongoose, *Atilax paludinosus*. These shy animals, living mostly under cover of the thick riverside vegetation of constant rivers, are very seldom seen. Although uncommon there, they sometimes also inhabit drier parts of the country where they may be found living amongst loose boulders and rock crevices of koppies and ridges.

Stories of their devastating raids on chicken coops and destruction of poultry is largely overrated and has caused their numbers to dwindle alarmingly. Their virtues, however, so greatly overshadow their weaknesses that a plea for their protection would not be unjustified.

The water mongoose, although regarded to be mainly nocturnal, appears to be most active from the late afternoon until evening and then again from dawn until the sun starts getting hot. They have, however, also been seen hunting and scavenging in broad daylight. Although mainly solitary in their habits, these animals are often seen in small family groups.

The animal's colour is usually dark-brown with a lighter tinge resulting from annulations on the hair. In older animals the colour seems to be more rusty-brown.

The Afrikaans name of " Kommetjiegatmuishond " is derived from the typical sunken hairless patch around the anus. The outer edge of this patch has a strong sphincter (circular) muscle by the aid of which the patch or " kommetjie " can be completely closed. An old wive's tale which is derived from this phenomenon claims that the mongoose catches poultry by the head with the aid of this muscular contraction.

A musk gland opens on either side of the anus, and when attacked the mongoose will, as a last resort, put these into action with most unpleasant odoriferous results to its opponent.

The diet of *Atilax* consists mainly of insects and aquatic animals like crabs, frogs and fresh-water mussels. Although in captivity it is fond of eating fish, from observations I doubt whether it is capable of catching a fish in deep water. Small fish may, however, be taken from shallow pools caused by the overflowing of rivers. Lizards, young birds and small rodents are included in its diet.

As its name implies, the water mongoose is a good swimmer and takes readily to water, diving and swimming under water in search of its prey.

Die dier se kleur is gewoonlik donkerbruin met 'n ligter skynsel wat te wyte is aan ligkleurige ringe om die hare. In ouer diere lyk die kleur meer roesbruin. Die naam kommetjiegatmuishond is afgelei van die tipiese haarlose gesonke gedeelte om die anus. Om die buitenste rand van hierdie gedeelte is 'n sterk *sphincter*-spier (kringspier) waarmee die „ kommetjie " heeltemal gesluit kan word. 'n Onwaar storie wat van hierdie verskynsel afgelei is, is dat die muishond deur hierdie spierwerking hoenders aan hulle koppe kan vang.

'n Muskusklier open aan elke kant van die anus en as hy aangeval word, sal die muishond, as laaste verdediging, hierdie kliere in werking stel met baie onaangename, onwelriekende resultate vir sy aanvaller.

Die dieet van die *Atilax* bestaan hoofsaaklik uit insekte en waterdiere soos krappe, paddas en varswatermossels. Hoewel die muishond daarvan hou om vis te eet, blyk dit uit waarnemings dat hy, na alle waarskynlikheid, nie daartoe in staat sal wees om vis in diep water te vang nie. Klein vissies wat in vlak poeletjies vasgekeer is, kan egter moontlik in die hande gekry word. Akkedisse, klein voëltjies en knaagdiere sowel as die eiers van grondbroeiende voëls word ook in die dieet ingesluit.

Soos sy naam aandui, is die watermuishond 'n goeie swemmer en gaan hy dikwels in die water, waar hy duik en op soek na sy prooi, onder die water swem.

Die interessantste van hierdie muishond se gedragspatroon is sy metode om mossels te breek. Die mossels word gevind deur met die voorpote in die vlakwater rond te voel. Sodra hy 'n mossel kry, dra die muishond dit in sy bek na 'n rots, klip of ander harde oppervlakte. Hy neem dan die mossel tussen sy voorpote, staan op sy agterpote en lig sy prooi so hoog op as moontlik, en dan gooi hy die mossel met so 'n geweldige slag teen die harde oppervlak dat die skulp breek en die inhoud geëet kan word. Enigeen wat al 'n lewendige mossel probeer oopbreek het, sal besef hoeveel krag hiervoor nodig is.

As eiers geëet word, probeer die muishond eers om die dop in sy bek te kraak, maar as dit nie geluk nie, word die eier ook met die voorpote van die grond af opgelig en laat val om sodoende 'n krakie in die dop te veroorsaak. 'n Gaatjie van omtrent een duim in deursnee word dan aan die kant van die eier in die dop gebyt en die inhoud uitgelek.

Die *Atilax* leef egter hoofsaaklik van insekte en in sy soektog na voedsel word klippies omgerol en sy voorpootjies in alle moontlike gaatjies en skeurtjies ingedruk om te „ voel " of daar nie goggas in is nie. Die goedontwikkelde reukvermoë van die muishond stel hom in staat om ondergrondse wurms, insekte en ander diertjies op te spoor, want mens sien hulle hierdie voedsel in die onwaarskynlikste plekke opgrawe.

Die muishondslangvangstorie is waar van die *Atilax*. 'n Mak muishondjie het uit haar eie 'n geellipslang (*Crotophopeltis*) en 'n skaapsteker (*Trimerorhinus*) aangeval en doodgemaak, maar geeneen van hulle geëet nie. Die muishonde, wat saam met die muskejaatkatte in die roofdierfamilie *VIVERIDAE* geklassifiseer word, word meesal in die warmer klimaatstreke gevind en die familie se verspreiding is tot Europa, Asië en Afrika beperk.

The most interesting of this mongoose's behavioural patterns is its method of cracking mussels. The mussels are located in shallow water by feeling the bottom with its front paws. On having found one it is taken out of the water in the mongoose's mouth and carried onto a rock, stone or other hard surface. The mongoose then takes the mussel between its front paws, rears up, lifting its prey as high as possible, and then throws the mussel onto the hard surface with such an impact that the shell is broken and its contents can be eaten. Anyone who has tried to open or crack a live mussel will be able to appreciate the force with which this action is executed.

When eggs are eaten, the mongoose first tries to crack the shell in its mouth. Should this fail the egg is also lifted from the ground with the front paws and dropped to cause a crack in the shell. A hole of about an inch in diameter is bitten into the side of the egg and the contents licked out.

Atilax does, however, subsist mainly on insects and in its search for food it is seen to turn up stones and push its front paws down every crevice or hole " feeling " for possible prey. Its keen sense of smell enables the mongoose to locate subterranean worms, insects or other animals, as it seems to be able to dig up food from what would seem the most unlikely places.

The mongoose snake story does apply to *Atilax*. A pet mongoose, of its own accord, attacked and killed a yellow-lipped snake (*Crotophopeltis*) and a skaapsteker (*Trimerorhinus*), neither of which were eaten.

Mongooses, which are classified in the Carnivorous family *VIVERIDAE* together with the civets and genets, are mostly found in warm climates and the family is confined to Europe, Asia and Africa.

DIE HANS MERENSKY-NATUURRESERVAAT

deur W. K. Kettlitz en T. B. Verschuur

INLEIDING.

DIE plaas Eiland No. 134 is aan die suidelike oewer van die Groot-Letabarivier in die distrik Letaba, Noordoostelike Transvaalse Laeveld, geleë. Die posisie word aangedui deur breedtegraad 23° 39′ S. en lengtegraad 30° 40′ O. Op die plaas kom daar 'n warmbron voor wat plaaslik goed bekend is, maar wat nie omskryf of aangeteken is voor 1941 nie. Die omliggende kontrei is plat bosveld waarvan die enigste opvallende kenmerk die Black Hills-rante is wat ook die oostelike grens van die plaas vorm. Die hoogte bo seevlak wissel van 1,380 tot 1,709 voet en die reënval is 20 tot 24 duim per jaar. Geologies word die vlei waarin die warmbron voorkom, gekenmerk deur 'n gneisgraniet, met 'n prominente dolorietdyk van moontlike na-Karoose tydvak, wat noord en suid van die vlei sigbaar is.

(Foto/Photo: G. L. Lombard.)

Oostelike hek met deel van heining.
Eastern gate and part of the boundary fence.

VERKRYGING VAN DIE TERREIN.

Gedurende 1950 het die gesamentlike eienaars, mnre. J. A. Pienaar en C. W. Bates, Eiland aan die Provinsiale Administrasie te koop aangebied. Dr. Theo Wassenaar, 'n lid van die Uitvoerende Komitee, het die aankoop van die plaas baie sterk aanbeveel en wel om die volgende redes: —

(*a*) Dit kon in 'n bosveldse vakansieoord ontwikkel word wat gedurende die winter baie gewild sou wees;

THE HANS MERENSKY NATURE RESERVE

by W. K. Kettlitz and T. B. Verschuur

INTRODUCTION.

THE farm Eiland No. 134 is situated on the southern bank of the Groot Letaba River in the Letaba District of the North-eastern Transvaal Lowveld. The position is given as latitude 23° 39′ S. and longitude 30° 40′ E. On the farm is a hot mineral spring, which, although well-known locally, was neither described nor recorded until 1941. The surrounding country is flat bushveld, the only prominent topographical feature being the Black Hills Range which forms the eastern boundary of the farm. The altitude varies from 1,380 to 1,709 feet and the rainfall is 20 to 24 inches per year. Geologically, the vlei in which the hot spring is situated, is characterised by gneissic granite, with a prominent dolerite dyke of probable post-Karoo age traceable both to the north and south of the vlei.

ACQUISITION OF SITE.

Eiland was offered for sale to the Provincial Administration by the joint owners Messrs. J. A. Pienaar and C. W. Bates during 1950. Dr. Theo. Wassenaar, a member of the Executive Committee, strongly recommended the acquisition of the farm for the following reasons:—

(*a*) It could be developed into a bushveld holiday resort which would be well patronised during the winter months;

(*b*) the hot spring rising on the farm could be turned into a modern spa which would also be popular in winter;

(*c*) it could be used as a bushveld game farm where all species of Lowveld game could be bred; and

(*d*) winter vegetables could be grown on the farm for distribution amongst nearby Central and School Farm Hostels.

Dr. Wassenaar also drew attention to the rapid expansion of agricultural activities along the Groot Letaba River which in a few years would oust all game from the area and the scenic gem which Eiland was, would then be lost to posterity.

The Executive Committee accordingly decided that if the Administrator, Dr. Wm. Nicol, who was on holiday at the time, also gave his sanction, the farm should be purchased at a cost of £25,000. Dr. Nicol spent a few days on the farm and was so enchanted by its beauty that he granted authority for its purchase immediately on his return to office.

The farm, 2,839 morgen in extent, was transferred in the name of the Government by Deed of Transfer No. 21483, dated the 23rd October, 1950, and physical occupation was taken on the 28th October, 1950.

(*b*) die warmbron op die plaas kon in 'n moderne spa omskep word wat ook in die winter populêr sou wees;

(*c*) dit kon as 'n bosveldse wildplaas gebruik word waar alle Laeveldse wildsoorte geteel kon word; en

(*d*) wintergroente vir verspreiding onder die koshuise van gesentraliseerde skole en plaasskole kon op die plaas gekweek word.

Dr. Wassenaar het ook die aandag gevestig op die snelle uitbreiding van landboubedrywighede al langs die Groot-Letabarivier wat binne afsienbare tyd sou meebring dat alle wildsoorte sou verdwyn en Eiland, die skilderagtige juweel, sou dan vir die nageslag verlore wees.

Die Uitvoerende Komitee het dientengevolge besluit dat indien die Administrateur, dr. Wm. Nicol, wat met vakansie was, ook sy goedkeuring daartoe verleen, die plaas aangekoop word vir 'n bedrag van £25,000. Dr. Nicol het 'n paar dae op die plaas deurgebring en het so in vervoering geraak oor die skoonheid daarvan dat hy by sy aankoms op kantoor onmiddellik goedkeuring tot die aankoop verleen het.

Die plaas, groot 2,839 morg, is oorgedra op naam van die Goewerment kragtens Akte van Transport No. 21483 van 23 Oktober 1950 en is op 28 Oktober 1950 in besit geneem.

'n Jaar later het dr. L. Albertyn 'n aangrensende plaas, gedeelte van Mabete No. 133, groot 1,845 morg, aan die Administrasie vir £8,000 aangebied. Die aanskaffing van hierdie plaas was belangrik in soverre as wat dit meer weiding vir die wild sou verskaf en die Mashovelspruit, wat sy oorsprong op Mabete het, die watervoorraad sou aanvul.

Die prys was redelik en die Uitvoerende Komitee het besluit om hierdie gedeelte van Mabete aan te skaf en die grond is behoorlik op naam van die Goewerment kragtens Akte van Transport No. 8536 van 12 Mei 1952 oorgedra.

Die suid-oostelike grens van Mabete het al langs die kruin van die Black Hills-rante geloop wat omheining van hierdie gedeelte van die plaas feitlik 'n onbegonne taak gemaak het. Die aanskaffing van 'n strook grond ten ooste van die Black Hills-rante sou nie net omheining toelaat nie, maar waardevol wees vir klipspringers en terselfdertyd die reeks rivier-, vlakte- en rantjieflora voltooi. Gevolglik is besluit om nog 49 morg van mnr. G. F. Earle, eienaar van die aangrensende plaas Vygeboom No. 451 teen £211. 13s. 3d. en 'n verdere 112 morg van mnr. S. J. Jackson, eienaar van die plaas Prieska No. 135 teen £1,795. 3s. aan te koop. (Aktes van Transport Nos. 20203 van 13 Augustus 1954 en 10427 van 1 Mei 1954 onderskeidelik, het betrekking.)

Kragtens Besluit No. 2177 van 8 Mei 1953 het die Uitvoerende Komitee besluit dat 'n gebied ongeveer 100 morg groot, insluitende die warmbron, aan die Raad van Kuratore vir Minerale Baaie vir latere ontwikkeling deur daardie Raad afgestaan word.

Die totale oppervlakte van die reservaat soos geproklameer by Administrateursproklamasie No. 223 van 8 September 1954, kom dus te staan op 4,847 morg, dit wil sê insluitende die eiendom van die Raad van Kuratore vir Minerale Baaie.

A year later Dr. L. Albertyn offered an adjoining farm, a portion of Mabete No. 133, 1,845 morgen in extent, to the Administration for £8,000. The acquisition of this farm was important in that it would increase grazing for the game and the Mashovel Spruit which rose on Mabete would augment the water supply. As the price was considered very fair and reasonable the Executive Committee decided to acquire this portion of Mabete and the land was duly transferred in the name of the Government by Deed of Transfer No. 8536, dated the 12th May, 1952.

The south-eastern boundary of Mabete ran along the crown of the Black Hills where fencing of this portion of the farm was virtually impossible. The acquisition of a strip of land to the east of the Black Hills would not only permit fencing but prove valuable for Klipspringers and at the same time complete the series of river, plain and hill flora. It was accordingly decided to purchase another 49 morgen from Mr. G. F. Earle, owner of the adjoining farm Vygeboom No. 451 at a cost of £211. 13s. 3d. and a further 112 morgen from Mr. S. J. Jackson, owner of the farm Prieska No. 135 at a cost of £1,794. 3s. (Deeds of Transfer Nos. 20203, dated the 13th August, 1954, and 10427, dated 1st May, 1954, respectively, refer.)

By Resolution No. 2177, dated 8th May, 1953, the Executive Committee decided that an area of approximately 100 morgen surrounding the Hot Spring be relinquished to the Mineral Baths Board of Trustees for future development by that Board.

The total area of the reserve as proclaimed by Administrator's Proclamation No. 223 of the 8th September, 1954, thus came to 4,847 morgen, i.e. including the property of the Mineral Baths Board of Trustees.

STAFF.

Mr. H. F. Malan was appointed as the first Inspector of Fauna and Flora for the reserve on the 26th June, 1950, and he held this post until his resignation on the 22nd January, 1957, when Mr. S. M. Zaayman took over.

(Photo/Foto: G. L. Lombard.)

Storage Shed. Skuur.

PERSONEEL.

Op 26 Junie 1950 is mnr. H. F. Malan as die eerste Inspekteur van Fauna en Flora op die reservaat aangestel en hierdie pos het hy beklee tot sy bedanking op 22 Januarie 1957 toe mnr. S. M. Zaayman van hom oorgeneem het.

Aangesien Inspekteurs van Fauna en Flora distriksbeamptes is, kon dit nie van mnr. Malan verwag word om die ontsaglike taak verbonde aan die omheining van 14 myl grensdrade te onderneem nie. Vir hierdie doel is mnr. Carl Waller op 7 Januarie 1951 as Tydelike Voorman aangestel. Nadat hy die 12-draad wildomheining, die plaaspaaie en vuurbrande al langs die grense van die hele plaas voltooi het, het hy op 16 Maart 1955 bedank.

Op 1 Desember 1955 is mnr. A. P. Cronje as Plaasvoorman in sy plek aangestel. Die oprigting van 'n skuur van 75 voet by 35 voet vir die huisvesting van trekkers, plaasimplemente en voorrade is aan hom toevertrou. Stalle en kampe vir huisdiere (koeie en perde) en vir wild (byvoorbeeld half-verhuislikte buffels) moes ook gebou word. Hy moes die bestaande omheinings, paaie en waterpompe onderhou en damme bou vir die wild en die vee, voorbrande maak en die reservaat patrolleer. Op 21 Junie 1957 het hy bedank.

Sy plek is ingeneem deur mnr. W. S. B. Basch. Intussen is 'n gebou wat eintlik vir bergruimte bedoel is, opgerig en aangesien daar geen huisvesting vir mnr. Basch was nie, is hy toegelaat om hierdie gebou as 'n tydelike maatreël te betrek.

Twee woonhuise is sedertdien opgerig en hulle word van 1 Februarie 1959 af deur mnre. Zaayman en Basch bewoon.

WATERVOORSIENING.

In November 1950 is 'n bedrag van £800 bewillig met die doel om die watervoorsiening aan te vul, vir die oprigting van 'n nuwe pompeenheid op 'n beoogde boorgat en vir die aankoop van verskeie plaasimplemente.

Op hierdie tydstip, naamlik op 26 Februarie 1950, het wyle dr. Hans Merensky aangebied om 'n volledig toegeruste boorgat gratis aan die Administrasie te verskaf. Hierdie aanbod is met dank aanvaar. 'n Boorgat met 'n opbrengs van 1,500 g.p.u. is deur dr. Merensky se eie boorman mnr. V. M. Neumann geboor wat spesiale lof toekom vir die voltooiing van 'n boorgat, 187 voet diep, in sowat vier dae. Hierdie boorgat lewer genoeg water vir baie doeleindes op daardie gedeelte van Eiland wat die verste weg van die rivier en die warmbron is.

As blyk van waardering vir hierdie mooi gebaar en die vurige belangstelling geopenbaar in die werksaamhede wat eersdaags op Eiland onderneem sou word, het die Uitvoerende Komitee voorgestel dat, met sy toestemming, die wildplaas en navorsingstasie genoem word die „Hans Merensky-natuurreservaat ”.

Dr. Merensky was hoog in sy skik met die eerbewys en by die aanvaarding daarvan, het hy die Administrateur bedank vir sy vriendelike gedagte.

As the Inspectors of Fauna and Flora are district officers it could not be expected of Mr. Malan to undertake the enormous task of fencing the 14 miles of boundary fencing required on the reserve. To this end Mr. Carl Waller was appointed as a Temporary Foreman on the 7th January, 1951. He resigned on the 16th March, 1955, after having completed the 12-strand game fence and the roads and firebreaks along the entire perimeter of the farm.

On the 1st December, 1955, Mr. A. P. Cronje was appointed in his place as Farm Foreman. He was entrusted with the erection of a 75 feet by 35 feet shed which would house tractors, farm implements and stores. Stables and camps for the domestic animals (cows and horses) and for game (e.g. semi-domesticated buffalo) had also to be built. He had to maintain existing fences, roads and waterpumps and also had to construct dams for the game and livestock, build firebreaks and patrol the reserve. He resigned on the 21st June, 1957.

His place was taken by Mr. W. S. B. Basch. In the meantime a building which had been intended for storage purposes was completed and as there was no dwelling-house available, Mr. Basch was allowed to occupy this as a temporary measure.

Two houses have since been erected and were occupied by Mr. Zaayman and Mr. Basch on the 1st February, 1959.

WATER SUPPLY.

In November, 1950, an amount of £800 was authorised for the purposes of augmenting the water supply, for the erection of a new pumping plant on a borehole yet to be sunk and for the purchase of various farm implements.

It was at this stage, on the 26th February, 1950, that the late Dr. Hans Merensky offered to provide a borehole fully equipped and at no cost to the Administration. This offer was gratefully accepted. A borehole yielding 1,500 g.p.h. was sunk by Dr. Merensky's own driller, Mr. V. M. Neumann, who deserves special credit for completing the borehole to a depth of 187 feet in a matter of four days. This borehole secures enough water for many purposes on the portion of Eiland furthest away from the river and the hot spring.

As a mark of appreciation of this fine gesture and the keen interest which Dr. Merensky had shown in the work which was about to be undertaken at Eiland, the Executive Committee proposed, with his concurrence, to designate the game farm and research station "The Hans Merensky Nature Reserve".

Dr. Merensky highly appreciated the honour proposed to be bestowed upon him and in expressing his approval of the name mentioned, conveyed his gratitude to the Administrator for his friendly thought.

Besides the river, which forms the northern boundary, various drinking places for game have been provided.

Near the north-eastern corner of the farm is drinking place No. 1, a dam which is perennial in normal years and has a bulldozed earthern embankment.

Afgesien van die rivier wat die noordelike grens uitmaak, is daar verskeie suipings vir wild aangebring. Naby die noordooshoek van die plaas is suiping No. 1. Dit is 'n dam met 'n grondwal en is noormaalweg standhoudend. Suiping No. 2 is ongeveer 1½ myl van die rivier af ook aan die noordekant van die plaas. Dit is 'n dam met 'n grondwal en is ook normaalweg standhoudend.

(Foto/Photo: G. L. Lombard.)

Groot-Letabarivier. Groot Letaba River.

Suiping No. 3 is 'n vlak dam of pan geleë in brakgrond. Dit is geleë in die kwarantynkamp langs die warmbron. Die dam is nie standhoudend nie, maar hou water tot laat in die winter.

Suiping No. 4 is 'n dam net buite die kwarantynkamp en is standhoudend.

Suiping No. 5 het 'n brak bodem met 'n taamlike klein opvanggebied en is nie standhoudend nie, maar hou water tot laat in die winter.

Suiping No. 6 is 'n natuurlike pannetjie wat sy water van 'n boorgat kry en is geleë op die Mashovelspruit. Die water in die pan word gereguleer deur 'n ondergrondse balklep. Dit is dus standhoudend aangesien die boorgat redelik sterk is. (Hierdie boorgat is die een wat deur wyle dr. Merensky aan die Administrasie geskenk is.)

Drinking place No. 2 is approximately 1½ miles from the river, also on the northern side of the farm. This comprises a dam with a bulldozed earthern embankment and is perennial during normal years.

Drinking place No. 3 is a dam built in brackish soil with a low embankment. It should rather be regarded as a pan. It is situated in the quarantine camp immediately behind the hot spring. The dam is not perennial, but holds water till late winter.

Drinking place No. 4 is a dam immediately outside the quarantine camp and is perennial.

Drinking place No. 5 is a small dam with brack bottom with a fairly small catchment area. It is not perennial, but holds water very well till late winter.

Drinking place No. 6 is a small natural pan with water derived from a borehole and is situated on the Mashovel Spruit. The water in the pan is regulated by an underground ball valve and is therefore perennial as the borehole is reasonably strong. (This is the borehole which was sunk by the late Dr. Merensky.)

Drinking place No. 7 is a longish ditch which is dammed up and holds water till late winter and is not perennial.

Drinking place No. 8, situated in the same catchment area as the former two but more to the southern point of the reserve, is also a pan with brack bottom, operated on the same principle as drinking place No. 6 and is therefore also perennial.

(Photo/Foto: G. L. Lombard.)

Watering place for game. Suiping vir wild.

Suiping No. 7 is 'n langerige braksloot wat opgedam word en wat sy water tot laat in die winter hou. Dit is nie standhoudend nie.

Suiping No. 8, ook geleë in dieselfde opvanggebied as die vorige twee, meer na die suidpunt van die reservaat. is ook 'n brak pannetjije wat op dieselfde beginsel werk as suiping No. 6. Dit is dus ook standhoudend.

Suiping No. 9 was ook bedoel om water te kry van 'n ou boorgat wat reeds op die reservaat was voordat dit aangekoop is. Hierdie boorgat was egter so swak dat die gedagte laat vaar is en dit is omskep in 'n dam met 'n grondwal. Hierdie dam is nie standhoudend nie. maar hou tog water tot laat in die jaar.

Suiping No. 10 is 'n nuwe dam met grondwal. Aangesien hierdie dam nog nie vol geword het nie kan daar nie nou gesê word of dit standhoudend sal wees nie. Die dam hou egter goed water.

Die watervoorraad vir wild is dus redelik goed oor die reservaat versprei en dit word goed gebruik met die gevolg dat die wild nie op die rivier saamdrom nie.

Tot dusver was daar altyd goeie suiping in die spruit wat by die warmbron verbyloop. Oorloopwater van die bron af voed hierdie suiping.

FLORA.

Die veld het 'n gemengde plantegroei met Mopanie (*Colophoespermum mopane*) en Rooibos (*Combretum* spp.) oorwegend. Die plantegroei op die rivier is tipies van hierdie streek en die groot Jakkalsbessie (*Diospyros mespiliformis*) en Mingerhout (*Adina microcephala*) is kenmerkend.

In die Mopanie- en Combretum-veld is daar groot lappe Driedoring (*Dalbergia melanoxylon*). Knoppiesdoring (*Acacia nigrescens*) en Maroela (*Sclereocarya caffra*) is goed verteenwoordig in die reservaat.

In die hoër dele aan die voet van die rante wat die oosgrens van die plaas uitmaak, kom baie Witsering (*Kirkia acuminata*) voor. Tambotie (*Spirostachys africanus*) is goed verteenwoordig in die laer dele en selfs op die rivieroewer.

WILDSOORTE.

Blouwildebeeste.—Toe die Administrasie die plaas aangekoop het, was daar heelwat blouwildebeeste. Hierdie wildsoort het sedertdien goed geteel en dermate vermeerder dat die wildstapel in 1959 beheer moes word.

Op die oomblik is daar ongeveer 400 van hierdie wildsoort op die plaas.

Sebras.—Hierdie soort was ook op die plaas ten tye van aankoop. Die getal is nou ongeveer 350.

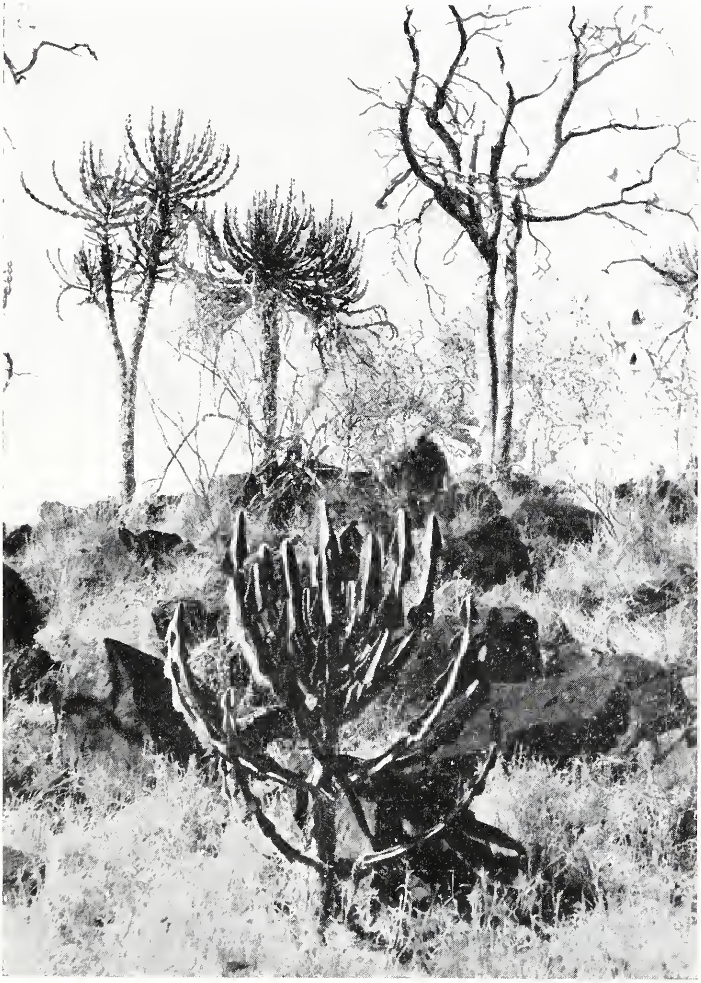
Rooibokke was ook op die plaas in 1950 en het nou vermeerder sodat daar vandag ongeveer 600 is.

Swartwitpense.—Van hierdie skaars wildsoort was daar 'n troppie toe die plaas aangekoop is. Vandag is daar ongeveer 100.

Koedoes was baie skaars toe die plaas aangekoop is. Die getal is egter nou baie bevredigend en daar is ongeveer 80 van hierdie wildsoort op die plaas.

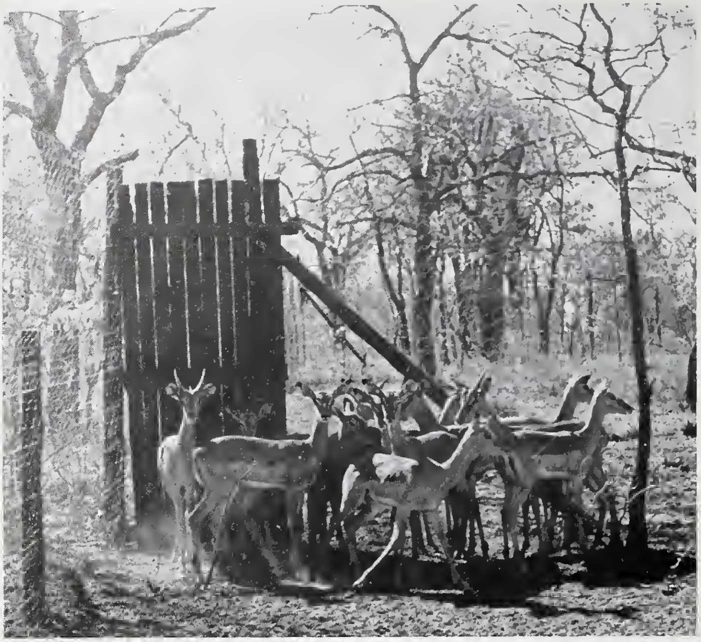
Drinking place No. 9 was also intended to be fed with water from an old borehole which was on the farm before it was bought. This borehole was, however, so weak that the idea was abandoned and the drinking place was converted into a dam with an earthern embankment. The dam is not perennial but also holds water till late in the year.

(Photo/Foto G. L. Lombard.)



Naboom or Noorsdoring (*Euphorbia cooperi*) on the Black Hills Range.
Naboom of Noorsdoring (*Euphorbia cooperi*) op die Black Hills-rante.

(Foto/Photo: G. L. Lombard.)



Rooibok-lammers wat aan boere verkoop sal word.
Impala lambs for distribution to farmers.

Waterbokke.—Toe die plaas aangekoop is, was daar 'n gevestigde trop waterbokke. Hulle getal is nou ongeveer 70.

Vlakvarke het baie vermeerder sedert die plaas se aankoop en daar is nou ongeveer 300 van hierdie soort wild. Die getal sal waarskynlik in die nabye toekoms beheer moet word.

Duikers.—Daar is heelwat duikers en daar word geskat dat daar ongeveer 40 op die plaas is.

Steenbokke.—Hulle is glad nie volop nie en daar is seker nie meer as 20 tot 30 nie.

Klipspringers is baie skaars in die rante wat die grens van die plaas vorm en daar is so min van hulle dat dit nie lyk of hulle gevestig sal word nie.

Bosbokke.—Hulle hou merendeel langs die Letabarivier en die getal word op 20 geskat.

Rietbokke.—Daar is sowat 20 van hierdie skaars wildsoort. Met die beskerming wat dit nou geniet, word daar gehoop dat hulle sal vermeerder.

Volstruise.—Toe die plaas aangekoop is, was daar net 'n paar op die reservaat. Met die toespan van die plaas het hulle getrek en is toe per ongeluk afgespan. Daar is toe weer van hulle ingevoer, maar die broei-

Drinking place No. 10 is a new dam with a bulldozed earthern embankment. As this dam has not filled up yet, it is impossible to say at this stage whether it will be perennial or not. The dam, however, retains its water satisfactorily.

The water supply for game is, therefore, fairly well distributed over the reserve and good use of it is made, thus preventing big concentrations of game on the river.

There had always been good drinking places in the ditch passing the hot spring. Overflow water from the spring feeds these.

FLORA.

The veld is covered with a mixed vegetation with Mopane (*Colophospermum mopane*) and " Rooibos " (*Combretum* spp.) predominating. The vegetation on the river is typical of these parts and the large Jakkalsbessie (*Diospyros mespiliformis*) and Mingerhout (*Adina microcephala*) are characteristic features.

In the Mopane and Combretum veld there are large patches of Driedoring (*Dalbergia melanoxylon*). Knobthorn (*Acacia nigrescens*) and and Maroela (*Sclerocarya caffra*) are well represented in the reserve.

In the upper regions at the foot of the hills which form the eastern boundary of the reserve, the white seringa (*Kirkia acuminata*) abounds. Tambootie (*Spirostachys africanus*) is well represented in the lower regions and also on the river side.

SPECIES OF GAME.

Blue Wildebeest.—When the Administration purchased the farm there was a considerable number of Blue Wildebeest. This species was very prolific and increased to such an extent that the numbers had to be drastically controlled in 1959.

At present there are approximately 400 of this species on the farm.

Zebra.—This species was also on the farm at the time of purchase. The number at present is approximately 350.

Impala were also on the farm in 1950 and have increased to about 600 today.

Sable Antelope.—There were only a few of this rare species when the farm was purchased. Today there are approximately 100.

Kudu were very rare when the farm was purchased. The increase is very satisfactory, however. and there are approximately 80 of this species on the farm now.

Waterbuck.—When the farm was purchased there was an established herd of Waterbuck. They now number approximately 70.

Warthog have increased considerably since the purchase of the farm and there are approximately 300 of this species at present. The number will probably have to be controlled in the near future.

Duiker.—There is a fair population of Duiker on the farm and the number is estimated at approximately 40.

Steenbuck.—They are by no means abundant and there are certainly not more than 20 to 30.

veld was nie baie suksesvol nie deurdat klein vleisetende diere al die kuikens doodgemaak het. Op die oomblik is daar slegs twee volstruise, maar daar word verwag om hierdie soort weer op die plaas gevestig te kry.

Voëls.—Vandat die plaas omhein is, het tarentale baie vermeerder en groot getalle word aangetref. Fisante en patryse het ook baie vermeerder. Op die damme wat gemaak is, word sekere tye van die jaar verskillende soorte watervoëls aangetref.

WILDSOORTE WAT OP DIE PLAAS INGEVOER IS.

Elande.—In 1958 is daar drie elande ingebring. Daar is nou vyf. Die elande is van Wes-Transvaal oorgeplaas en hulle het in die begin swaar gekry om hulle aan te pas by die nuwe voedingstoestande. Dit lyk nou egter of hulle gevestig is.

Kameelperde.—Sedert 1952 is daar kameelperde van die Klaseriegebied af na die reservaat gebring. Hulle aard besonder goed en op die oomblik is daar reeds 14 waarvan twee op die plaas gebore is.

(Foto/Photo: G. L. Lombard.)

Drukgang vir vang van wild.

Crush passage for catching game.

(Photo/Foto: G. L. Lombard.)

Swimming pool at the hot spring. Swembad by warmbron.

Klipspringer are very rare in the hills forming the farm boundary and the number of this species is so low that it is feared that they will not become established.

Bushbuck.—Their habitat is primarily along the Letaba River and the number is estimated at 20.

Reedbuck.—This rare species numbers approximately 20. With their protection assured an increase is expected.

Ostrich.—When the farm was purchased there were only a few. While the farm was being fenced they moved and were inadvertently fenced out. Some were reintroduced, but the broods were not very successful as small carnivora killed all the chickens. At the moment there are only two ostriches, but it is hoped to have the farm restocked with this species.

Birds.—Since the fencing in of the farm the number of guinea-fowl has increased considerably and large numbers are found. Pheasants and partridges have also increased considerably. On the dams which have been constructed various species of waterfowl are found during certain times of the year.

SPECIES OF GAME INTRODUCED ONTO THE FARM.

Eland.—In 1958 three Eland were introduced. They now number five. The Eland were transferred from the Western Transvaal and found it difficult at first to adapt themselves to the new feeding conditions. It would appear, however, that they are now well established.

Basterhartbeeste.—Dié wildsoort het reeds jare gelede verdwyn in dié gebied. Deur die welwillendheid van die eienaars van Fleur de Lys-landgoed, is daar in 1954 'n klompie op daardie plaas gevang en na die reservaat oorgeplaas. Hulle het goed gevorder en in 1958 was daar reeds 14. Teen die einde van 1958 het dié bokke skielik begin doodgaan. Die oorsaak van die verliese is nie bekend nie, maar volgens die gegewens wat ingesamel kon word, is die vrekte aan hartwater te wyte. Dieselfde verskynsel het ook op hierdie tydstip in ander distrikte en, na verneem word, ook in die Nasionale Krugerwildtuin voorgekom. Daar is nou nog net twee basterhartbeeste op die plaas oor. Daar sal egter pogings aangewend word om weer te vang en oor te plaas om hierdie soort op die reservaat te probeer vestig.

DIE WARM BRON.

Die bron het sy oorsprong op Eiland en is maklik bekombaar daar dit slegs 300 tree suid van 'n redelike goeie pad is. „Hotbaths"-halt, vlak by die bron, is 25 myl van Rubbervale af. Die afstande na Letsitele en Tzaneen per pad, is onderskeidelik 25 en 44 myl.

Die fontein vloei in 'n klein vlei net effens laer as die oppervlakte van die omliggende bosveld wat geleidelik afsak na die Groot-Letaba-rivier.

Die hoofoog is op die bodem van 'n poel van 16 voet by 13 voet en sowat 4 tot 5 voet diep. Die kante is met sterk planke uitgevoer. Die poel is uit 'n turfmoeras gegrawe en daarom is 'n paar vragte growwe sand op die bodem gestrooi.

Wanneer die water nie versteur word nie, is dit kristalhelder maar met ongereëlde tussenposes borrel daar gas saam met die warm water op.

Die onmiddellike omgewing van die bron is 'n verdrinkte moeras waarin 'n staaf tot 8 voet ingedruk kan word sonder om enige merkbare weerstand teë te kom. Die materiaal is 'n tipe moerasturf klaarblyklik gevorm deur die gedeeltelike verrotting van plante, hoofsaaklik riete.

ARGEOLOGIE.

Bates in sy „Preliminary Report on Archeological Sites on the Groot Letaba River" vermeld:—

> „The vlei is traversed by an intermittent watercourse, known amongst local natives as the Mamzabo, along which are to be found a large number of earth mounds containing potsherds, fragments of soapstone vessels, bone implements, stone tools and shells of river mussels and land snails. Stone Age factory sites occur in various parts of the farm.
>
> "The only published reference to these mounds is the following extract from 'The Letaba Hot Spring', by Leslie E. Kent (Trans. Roy. S. Afr., Vol XXIX, Part II): 'The spring was known to and utilised by the native inhabitants, both as a bath and a source of salt, before the European settlement. This salt was obtained by lixiviating the mud through which the water issued and evaporating the resultant solution over open fires in clay pots. The heaps of extracted earth scattered over an area of about half a square mile near the edge of the vlei beside the Mamazapi (pronounced Mamzabo by local natives) watercourse are relics of this industry.' Kent, however, makes no mention of the archaeological material with which the area abounds . . . Eiland is a closed

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Giraffe.—Since 1952 giraffe have been introduced to the reserve from the Klaserie area. They thrive particularly well and at present there are no fewer than 14, two of which were born on the farm.

Sassaby.—This species became extinct in the area many years ago. With the goodwill of the owners of the Fleur de Lys Estate, a number of this species was captured on that farm and transferred to the reserve where they thrived and increased to 14 in 1958. Towards the end of 1958 this species suddenly began to die off. The cause of death is not known but according to available data it is believed to have been heartwater. The same phenomenon also occurred in other districts at that time and in the Kruger National Park as well. All that remain on the farm now are two Sassaby. Efforts will, however, be made to reintroduce this species.

THE HOT SPRING.

The spring rises on Eiland and is readily accessible being only 300 yards south of a fairly good road. "Hotbaths" Halt, which is right at the spring, is 25 miles from Rubbervale. The distances by road to Letsitele and Tzaneen are 25 and 44 miles respectively.

The spring issues in a small vlei only slightly below the general level of the surrounding bushveld, which slopes gently down to the Groot Letaba River.

The principal eye of the spring is on the bottom of a pool measuring 16 by 13 feet which is some four to five feet deep. The sides are lined with stout planks. The pool has been dug out of a peat bog and, in consequence, several loads of gravelly river sand have been strewn on the bottom.

When undisturbed the water in the pool is crystal clear and is unsettled at irregular intervals by surges of gas that bubbles up together with the hot water.

The immediate vicinity of the spring is a waterlogged swamp into which a rod may be pushed for a distance of at least eight feet without encountering any appreciable resistance. The material is a type of peat, obviously formed by the partial decay of vegetation, principally reeds.

ARCHAEOLOGY.

Bates, in his Preliminary Report on Archaeological Sites on the Groot Letaba River, states:—

> "The vlei is traversed by an intermittent watercourse, known amongst local natives as the Mamzabo, along which are to be found a large number of earth mounds containing potsherds, fragments of soapstone vessels, bone implements, stone tools and shells of river mussels and land snails. Stone Age factory sites occur in various parts of the farm.
>
> "The only published reference to these mounds is the following extract from 'The Letaba Hot Spring', by Leslie E. Kent (Trans. Roy. S. Afr., Vol XXIX, Part II): 'The spring was known to and utilised by the native inhabitants, both as a bath and a source of salt, before the European settlement. This salt was obtained by lixiviating the mud through which the water issued

site in the sense that it has never before been investigated archaeologically or disturbed by vandals. Unfortunately, however, considerable erosion by flood water has taken place along the banks of the watercourse traversing the mound areas, and a great deal of archaeological material has been carried down to the Groot Letaba River and lost. In some places the mounds have collapsed into the watercourse making it impossible to trace the original horizons, with the result that potsherds and soapstone of different horizons are found in hopeless confusion with stone age implements and modern Basuto pottery.

" Potsherds, in association with worked soapstone, are found in great abundance in and around the mounds. While some are probably recent, the bulk bear a strong resemblance to Sotho ware from the various Northern Transvaal sites . . .

" Soapstone is found in association with pottery in and around most of the mounds . . . To date I have taken fragments of over 100 soapstone vessels and this is only a fraction of what still awaits the investigator . . ."

NAVORSING.

Gedurende Junie 1953, het professor R. H. Goetz, Hoof van die Departement Chirurgiese Navorsing van die Universiteit Kaapstad, die Direkteur van Natuurbewaring genader met die doel om lewende kameelperde te verkry waarop hy navorsing in verband met die haemodinamika van hartkwale en hoë bloeddruk kon doen. Professor Goetz was van mening dat die vraagstuk van personeel wat in hoogspoedvliegtuie bewusteloos raak, nader aan oplossing gebring kon word deur die bloedsomloop in die brein van die kameelperd te ondersoek. „In this animal, by virtue of its height, special circulatory mechanisms must be in use preventing anaemia of the brain in the erect position and unduly high pressure in the dependent position of the head." Hy was van voornemens om hierdie regulerende meganismes, insluitende die senubane en die neksinusreflekse te bestudeer.

Ten einde aan Professor Goetz se versoek te voldoen, is gereël dat lewende kameelperde tesame met dié wat vir herbevolkingsdoeleindes benodig was, gevang en na die reservaat gebring sou word waar hulle in 'n kamp vir 'n paar maande gehou sou word om hulle mak te maak. Omdat dit ook nodig sou wees om dooie kameelperde te ondersoek, is reëlings getref om party diere in die Klaserie-gebied van die distrik Pelgrimsrus te dood. Hierdie handelwyse was in enige geval alreeds deur die plaaslike Fauna en Flora Advieskomitee aanbeveel aangesien kameelperde in hierdie gebied in die afgelope jare aansienlik vermeerder en skade aan ryslande en omheinings veroorsaak het.

Verskillende liggame het meegewerk om die onderneming die sukses te maak wat dit was: Die Wetenskaplike en Nywerheidsnavorsingsraad, afgesien van verskeie departemente van die Universiteit Kaapstad, het as beskermheer van die navorsingswerk opgetree; die Departement van Verdediging het vervoer verskaf, nl., twee drie-tonvragmotors, 'n vragmotor met elektriese ontwikkelaar, 'n waterkar en een jeep, met drywers; die ganse uitrusting van die Masana-sendinghospitaal by Bosbokrand is tot die beskikking van die Professor geplaas; die Transvaalse Museum het 'n diereopstopper met sy eie vervoer gestuur en die Onderstepoortse Laboratorium het vir die versameling van parasiete gereël.

and evaporating the resultant solution over open fires in clay pots. The heaps of extracted earth scattered over an area of about half a square mile near the edge of the vlei beside the Mamazapi (pronounced Mamzabo by local natives) watercourse are relics of this industry.' Kent, however, makes no mention of the archaeological material with which the area abounds . . . Eiland is a closed site in the sense that it has never before been investigated archaeologically or disturbed by vandals. Unfortunately, however, considerable erosion by flood water has taken place along the banks of the watercourse traversing the mound areas, and a great deal of archaeological material has been carried down to the Groot Letaba River and lost. In some places the mounds have collapsed into the watercourse making it impossible to trace the original horizons, with the result that potsherds and soapstone of different horizons are found in hopeless confusion with stone age implements and modern Basuto pottery.

"Potsherds, in association with worked soapstone, are found in great abundance in and around the mounds. While some are probably recent, the bulk bear a strong resemblance to Sotho ware from the various Northern Transvaal sites . . .

"Soapstone is found in association with pottery in and around most of the mounds . . . To date I have taken fragments of over 100 soapstone vessels and this is only a fraction of what still awaits the investigator . . ."

RESEARCH.

During June, 1953, Professor R. H. Goetz, Head of the Department of Surgical Research at the University of Cape Town, approached the Director of Nature Conservation with the object of procuring live specimens of giraffe on which he could do research into the haemodynamics of heart disease and high blood pressure. Professor Goetz was of the opinion that the black-out problem in personnel of high-speed aircraft could be brought nearer solution by examining the circulatory system of the brain in the giraffe. "In this animal, by virtue of its height, special circulatory mechanisms must be in use, preventing anaemia of the brain in the erect position and unduly high pressure in the dependent position of the head." It was his intention to study these regulatory mechanisms, including also the nervous pathways and the carotid sinus reflexes.

In order to comply with Professor Goetz's request it was arranged that live giraffe would be captured together with those required for restocking and taken to the reserve where they would be kept in a paddock and tamed over a period of several months. As it would also be necessary to examine dead giraffe, arrangements were made to destroy some animals in the Klaserie area of the Pilgrim's Rest District. This action had in any event already been recommended by the local Fauna and Flora Advisory Committee as giraffe had increased considerably in this vicinity over the past few years and were causing damage to rice fields and fences.

Several bodies collaborated in making the expedition the success it proved to be: The research work was patronised by the Council for Scientific and Industrial Research, apart from various departments of the University of Cape Town; the Department of Defence provided transport in the shape of two three-ton trucks, a motor truck with generator, a water truck and one jeep, plus the drivers; the entire equipment of the

Die ekspedisie het op 15 Augustus 1954 in Pretoria aangekom en het twee dae later sy werksaamhede in die veld begin. 'n Maand later het Professor Goetz aan die Direkteur van Natuurbewaring geskryf en hom en sy personeellede bedank vir die opregte en entoesiastiese medewerking wat hy ontvang het en aangedui dat hy tevrede was met die wetenskaplike resultate wat verkry is, „although obviously some of them are rather limited ". Professor Goetz het toe die kwessie van 'n tweede ekspedisie met die volgende uitlating ter sprake gebring: „All in all these investigations can only be regarded as a preliminary canter, and I think we should straight away plan to return to Eiland some time in the future. With all the knowledge we have now gained, we should be able to repeat the investigations on a somewhat bigger animal and get better results under more normal conditions."

Gedurende Januarie 1955 het Professor Goetz weer die kwessie van 'n tweede ekspedisie geopper, maar hy was angstig om sy navorsing uit te voer op lewende kameelperde wat op die reservaat gevang en mak gemaak moes word. Terselfdertyd het hy voorgestel dat die Administrasie vir sy moeite om die kameelperde te vang en op Eiland aan te hou, vergoed moet word. (Later het dit aan die lig gekom dat Professor Goetz Amerika met behulp van 'n Carnegie-toelae besoek het en die belangstelling van sy Amerikaanse kollegas so gaande gemaak het dat geldelike steun vir die tweede ekspedisie uit hierdie bron sou kom.)

Die resultate van die toetse is in die Suid-Afrikaanse Tydskrif vir Geneeskunde van 13 Augustus 1955 gepubliseer.

'n Tweede internasionale wetenskaplike ekspedisie onder beskerming van die Wetenskaplike en Nywerheidsnavorsingsraad, en gefinansier en toegerus deur die United States Navy Office of Naval Research en die Unie-verdedigingsmag het Eiland in Oktober 1956, besoek, weer onder leierskap van Professor Goetz.

Voortspruitende uit die 1954-ekspedisie het baie misverstande oor die bloedsomloop van kameelperde aan die lig gekom en hierdie bevindings sowel as ander, het 'n voltydse navorsingsprogram noodsaaklik gemaak.

Professor James Warren, van Duke University, North Carolina; Professor John Patterson, van die Medical College te Richmond, Virginia; dr. Joseph Doyle, van die Albany Medical College, New York, en mnr. Morris Smith, 'n tegniese vlootassistent van Hampton, Virginia, was die lede van die Verenigde State.

Duitsland het Professor Otto Gauer van die Max Planck-instituut, Bad Nauheim, gestuur en die ekspedisie se werksaamhede is deur mnr. Lewis Lewis, van Seepunt, Kaapstad, verfilm.

Die Afdeling Natuurbewaring het weer as gasheer opgetree en die Suid-Afrikaanse lede het dr. E. M. Keen, van die Departement van Anatomie van die Universiteit Kaapstad en mnr. L. W. Piller, 'n tegniese assistent en elektronika-deskundige van die Hartkliniek, Groote Schuurhospitaal, Kaapstad, ingesluit.

Die korrelasie en publikasie van die uitslae van hierdie belangrike ekspedisie is ernstig vertraag, hoofsaaklik as gevolg van die groot afstande tussen die lede van die span.

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Masana Mission Hospital at Bushbuckridge was placed at the Professor's disposal; the Transvaal Museum sent a taxidermist in its own truck and the Onderstepoort Laboratories arranged for the collection of parasites.

The expedition arrived in Pretoria on the 15th August, 1954, and commenced operations in the field two days later. A month later Professor Goetz wrote to thank the Director of Nature Conservation and his staff for the wholehearted and enthusiastic co-operation he had received and indicated that he was pleased with the scientific results obtained, "although obviously some of them are rather limited". Professor Goetz then mooted a second expedition in these words: "All in all these investigations can only be regarded as a preliminary canter, and I think we should straightaway plan to return to Eiland some time in the future. With all the knowledge we have now gained we should be able to repeat the investigations on a somewhat bigger animal and get better results under more normal conditions."

During January, 1955, Professor Goetz again raised the question of a second expedition, but was anxious to carry out his research on live giraffe to be captured and tamed at the reserve. At the same time he suggested that the Administration should be reimbursed for its effort in capturing and maintaining the giraffe at Eiland. (It transpired at a later date that Professor Goetz had visited America under a Carnegie Grant and that he had so interested his American colleagues that financial support for the second expedition would be forthcoming from this source.)

The results of the experiments were published in the *South African Medical Journal* of the 13th August, 1955.

A second international scientific expedition sponsored by the Council for Scientific and Industrial Research and which was financed and equipped by the United States Navy Office of Naval Research and the Union Defence Force visited Eiland in October 1956, again led by Professor Goetz.

Following upon the 1954 expedition many misconceptions were found regarding the blood circulation of giraffes and this, together with other findings necessitated a full research programme.

Professor James Warren, of Duke University, North Carolina, Professor John Patterson, of the Medical College of Richmond, Virginia, Dr. Joseph Doyle, of the Albany Medical College, New York, and Mr. Morris Smith, a Navy technical assistant from Hampton, Virginia, were the United States members.

Germany sent Professor Otto Gauer, of the Max Planck Institute, Bad Nauheim, and the expedition's work was filmed by Mr. Lewis Lewis of Sea Point, Cape Town.

The Nature Conservation Section again acted as host and South African Members included Dr. E. N. Keen, of the Department of Anatomy of the University of Cape Town and Mr. L. W. Piller, a technical assistant and electronics expert of the Cardiac Clinic, Groote Schuur Hospital, Cape Town.

The correlation and publication of the results of this important expedition have been seriously delayed, probably as a result of the great distances separating the members of the team.

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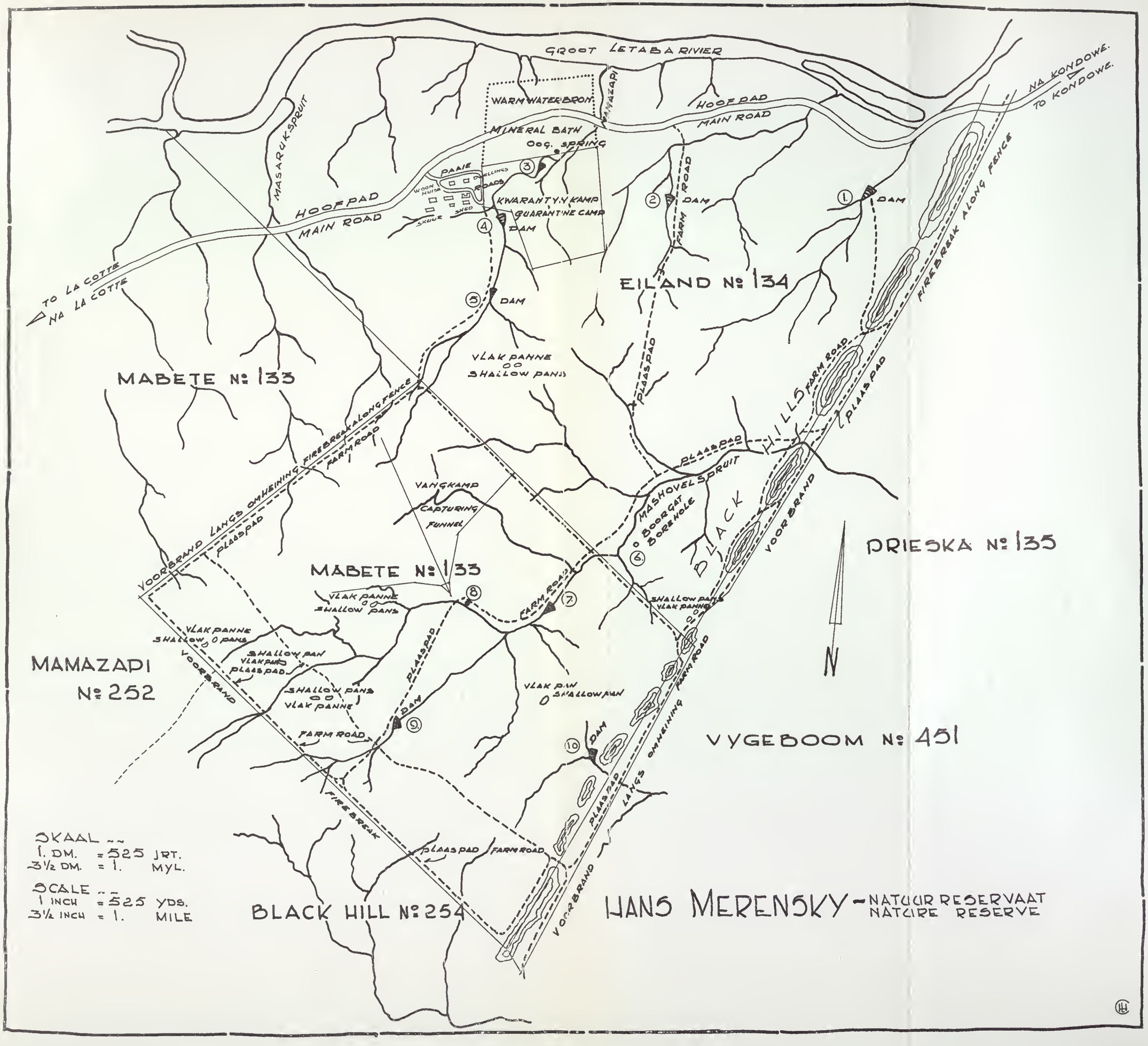
BATES: "A Preliminary Report on Archaeological Sites on The Groot Letaba River, North Eastern Transvaal." South African Journal of Science, Vol. XLIII, pp. 365-375, July, 1947.


GROOT LETABA RIVIER
WARM WATER BRON
MAMAZAPI
MINERAL BATH
OOG. SPRING
HOOF PAD
MAIN ROAD
NA KONDOWE.
TO KONDOWE.
PAAIE
ROADS
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WOON HUISE
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NA LA COTTE
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VLAK PANNE
SHALLOW PANS
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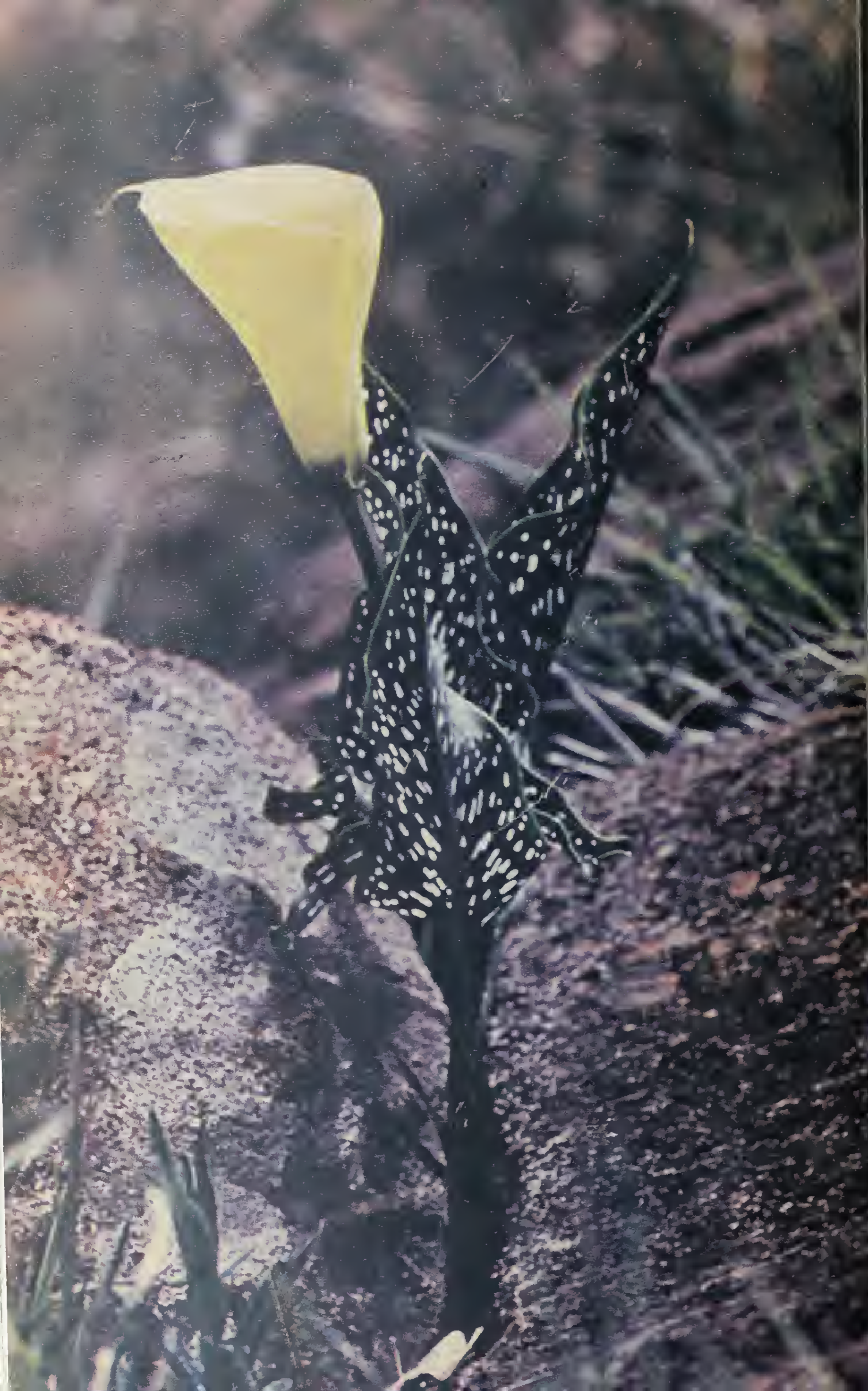

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ERRATA.

Bladsy 8—*Foto.*—Lees „ produksiedamme ” in plaas van „ produksi edamme ”.

Bladsy 16—*Para.* 2, 2*de reël.*—Lees „ aanvraag ” in plaas van „ vraag ”.

Bladsy 28.—By persentasies van totale wateroppervlak, lees „ Broeidamme ... ... 1·25 persent ” in plaas van „ 9·25 persent ”.

Page 29.—Percentages of total water surface, read Breeding ponds ... ... “ 1·25 per cent ” instead of “ 0·25 per cent ”.

Bladsy 43.—Lees „ Oorblyfsels van *Tilapia* ” in plaas van „ Oorblyfsels van *Tilopia* ”.

Bladsy 68.—No. (29) Lees „Schweizerbart'sche” in plaas van „Schwezeirbart'sche”.

Page 69.—Read “ (27) ” instead of “ 527 ”.

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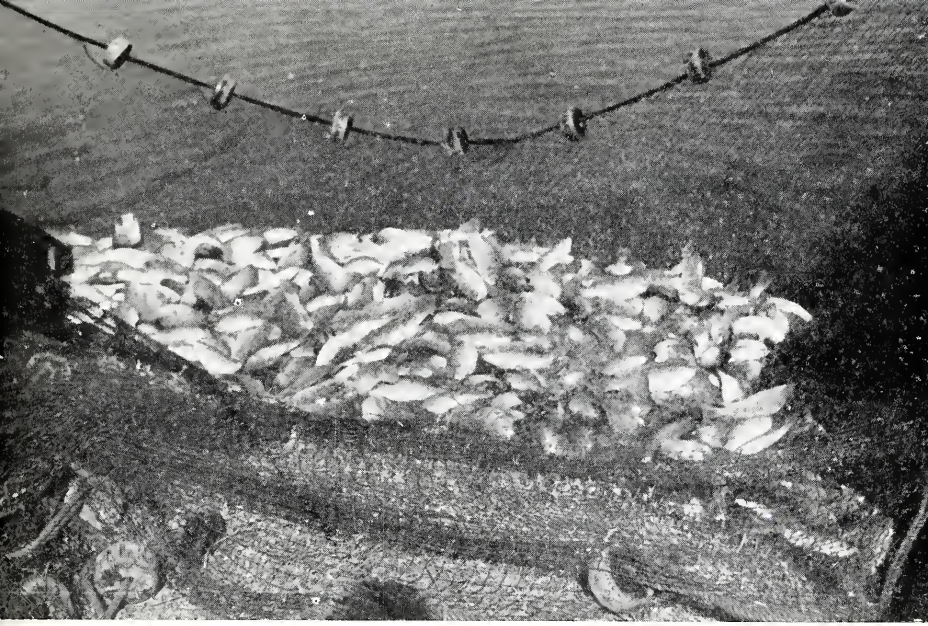

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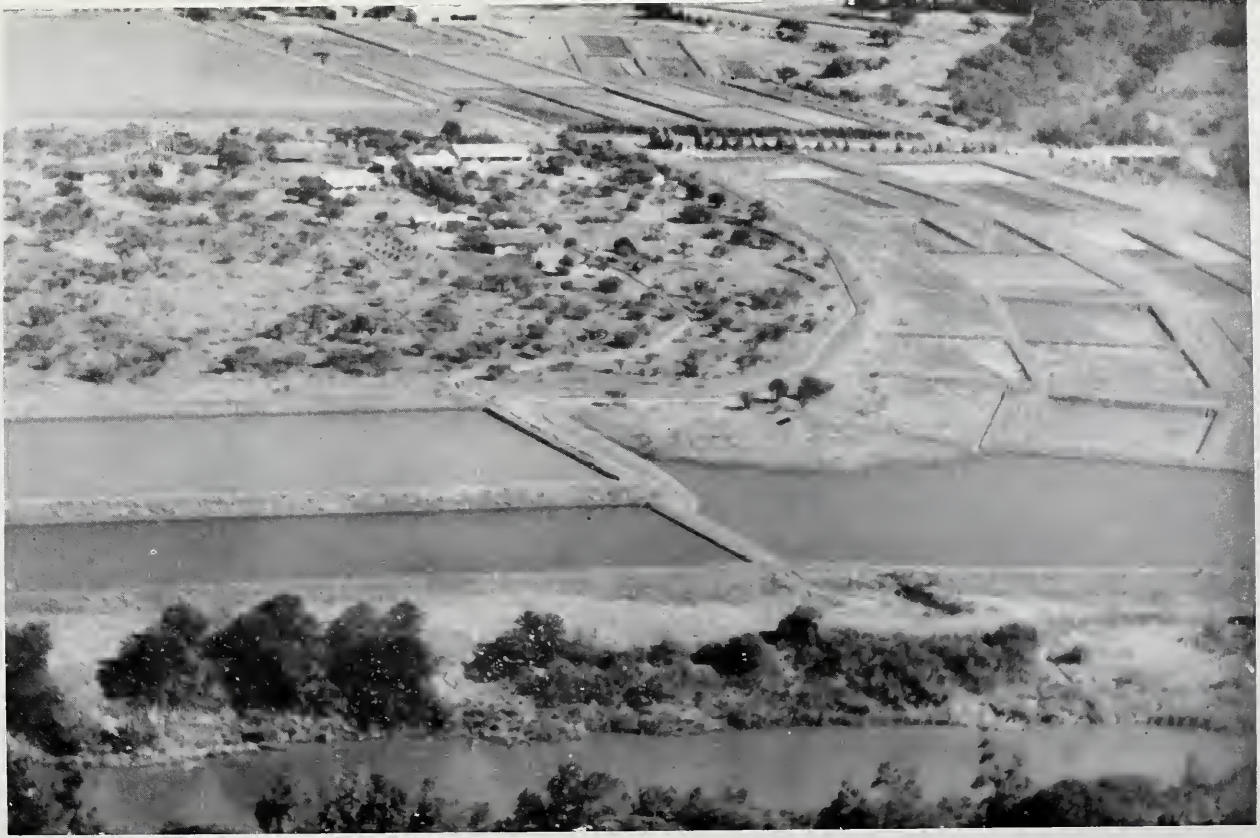

Lugfoto van die Visserynavorsingstasie. Aerial view of the Fisheries Research Station.

[Foto: Afrikaanse Lugfoto (Edms.) Bpk., Germiston.]
[Photo: African Air Photo (Pty.), Ltd., Germiston.]

INHOUD

Bladsy.

Die Laeveldse Visserynavorsingstasie naby Marble Hall 4

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DIE LAEVELDSE VISSERYNAVORSINGSTASIE NABY MARBLE HALL

deur dr. G. L. Lombard

AS mens oor die Elandsrivierbrug op Rooibokkop ry, word die tipiese bosveldlandskap onderbreek deur 'n lapwerk van netjiese vierkantige damme met helder groen grasbegroeide walle. U bevind u dan op die Laeveldse Visserynavorsingstasie van die Transvaalse Provinsiale Administrasie.

Tot Augustus 1953, toe met die konstruksiewerk van hierdie navorsingstasie 'n aanvang gemaak is, was hierdie perseel van 57 morg 'n stukkie onverstoorde Bosveld; 'n stukkie Bosveld wat die kreun van die eerste Voortrekkerwaens gehoor het toe die trekkers langs die linkeroewer van die Olifantsrivier hier by die Elandsdrif deurgetrek het op hulle epiese trek na die Noorde.

Reeds op 17 Julie 1942, dit wil sê, nog vyf jaar voor die benoeming van 'n Visserybeampte in Transvaal, is die ekonomiese aspek van visboerdery teenoor die sportwaarde van riviervis beklemtoon op interprovinsiale samesprekings wat te Kaapstad gehou is.

In 'n besluit van die Uitvoerende Komitee van die Transvaalse Provinsiale Raad in Februarie 1948 is daar, onder andere, goedkeuring geheg aan die oprigting van 'n Hoofbroeistasie vir vis te Lydenburg en 'n Laeveldse Broeistasie onderkant Loskopdam. Daar is dieselfde jaar reeds 'n begin gemaak met die konstruksie van die Instituut op Lydenburg. Ondersoek het geblyk dat die voorgestelde terrein vir die Laeveldse stasie onderkant Loskopdam ongeskik was vir die bou van

Konstruksiewerk aan die damme by die Visserynavorsingstasie naby Marble Hall.

Construction of the dams at the Fisheries Research Station near Marble Hall.

THE LOWVELD FISHERIES RESEARCH STATION NEAR MARBLE HALL

by Dr. G. L. Lombard

ON crossing the Elands River Bridge on the farm Rooibokkop, the typical Bushveld landscape is replaced by a patchwork of neat rectangular dams with bright green grass-covered walls. This is the Lowveld Fisheries Research Station of the Transvaal Provincial Administration.

Until August, 1953, when the construction work on the research station was commenced, this 57 morgen plot was an undisturbed patch of Bushveld; a patch of bush which had known the groaning of the wagons when the first white pioneers moved slowly and lumberingly along the left bank of the Olifants River and forded the Elandsdrift on their epic journey to the North.

At interprovincial discussions held in Cape Town on the 17th July, 1942, i.e. five years before the appointment of a Fisheries Officer in the Transvaal, the economic aspect of fish farming was stressed as opposed to the sporting value of fish in natural waters.

In February, 1948, the Executive Committee of the Transvaal Provincial Administration approved the erection of a main Fisheries Station at Lydenburg and a Lowveld Fisheries station below the Loskop Dam. The construction work of the Institute at Lydenburg was commenced in the same year. The proposed site for the Lowveld station below the Loskop Dam was found to be unsuitable for the construction of dams and a more suitable piece of ground was decided upon on the farm Rooibokkop at the confluence of the Elands and Olifants Rivers.

Temporary Laboratory and Office. Tydelike Laboratorium en kantoor.

damme. 'n Geskikter stukkie grond is toe gevind op Rooibokkop by die sameloop van die Elands- en die Olifantsrivier. Op die dag voor Kersfees in 1951 is die huidige terrein van die Laeveldse Visserynavorsingstasie, perseel G 36, toe deur Sy Edele, die Minister van Lande aan die Provinsie oorgedra en in Augustus 1953 is met die konstruksie van die laeveldse stasie naby Marble Hall begin. Die perseel wat 2,700 vt. bo seespieël lê, is deel van die Loskop-besproeiingskema en die water wat van Loskopdam af kom, loop 60 myl ver met kanale voordat dit die navorsingstasie bereik.

In Mei 1954 was die damme by die nuwe Visserynavorsingstasie reeds sover gevorder dat al die laeveldse kurpers van Lydenburg af daarheen oorgeplaas kon word.

Deur omstandighede is die konstruksiewerk sodanig vertraag dat dit nie voor Mei 1957 was dat die gedreun van die kruiptrekker gestaak is en die voltooide visdamme kon glinster in die rustigheid van die bosveldson nie.

In teenstelling met die Lydenburgse Instituut waar die werk toegespits is op hengelprobleme, is die Laeveldse stasie beplan vir visboerderynavorsing. Onder laasgenoemde verstaan ons die doelbewuste produksie van vis as voedsel, waar die vis 'n plaasproduk word en vir eie tafelgebruik of vir die mark geproduseer word.

Vis word in tenk gelaai vir oorplasing na sorteerdam.
Fish being loaded into tank for transfer to sorting dam.

Heelwat moeilikheid is ondervind om 'n geskikte tegniese persoon te kry met genoegsame kennis van hierdie onderwerp en 'n opgeleide visteelkundige, mnr. K. H. Eins, is uit Duitsland ingevoer om hierdie pos te vul. Nadat mnr. Eins meer as 'n jaar op Lydenburg werksaam was om met ons toestande vertroud te raak, is hy in Junie 1954 oorgeplaas na

Fish being released into sorting dam. Vis word in sorteerdam losgelaat.

On the day before Xmas in 1951, the present site of the Lowveld Fisheries Research Station, Plot G 36, was ceded to the Province by the Honourable the Minister of Lands and in August, 1953, the construction near Marble Hall was begun. Plot G 36, which lies at an altitude of 2,700 feet, is part of the Loskop Irrigation Scheme and the water supply from the Loskop Dam covers sixty miles in canals before it reaches the research station.

In May, 1954, the dams of the new research station had progressed to such an extent that all the Lowveld *Tilapias* or kurper could be transferred there from Lydenburg.

Through circumstances the construction work was held up to such an extent that it was not until May, 1957, that the roaring of the bulldozer could cease, allowing the completed dams to lie glimmering in the peace and calm of the African bush.

In contrast to the Lydenburg Institute, where the work is focussed on angling problems, the Lowveld Station is planned for research in connection with fish farming. By fish farming we understand the intentional production of fish for food, where fish is a farm product produced for own consumption or for the market.

There was some difficulty in finding a suitable technical person with sufficient knowledge on this subject and a trained fish culturist, Mr. K. H. Eins, was imported from Germany to fill this post.

After Mr. Eins had spent more than a year at Lydenburg to acquaint himself with our conditions, he was transferred to Marble Hall in June, 1954, where the fish-culture was entrusted to his care. At this stage the only building on the site was a pre-fabricated dwelling. The construction staff working under Mr. G. J. P. Olivier of Lydenburg were living in tents.

Marble Hall waar die visteelt aan hom toevertrou is. Op dié tydstip was die enigste gebou op die terrein 'n voorafvervaardigde huis. Die konstruksiepersoneel, onder leiding van mnr. G. J. P. Olivier van Lydenburg, het in tente gewoon.

In 1955 is nog 'n voorafvervaardigde woonhuis en 'n tydelike laboratorium met buitegeboue opgerig, en in September van dieselfde jaar het die eerste Vakkundige Beampte van hierdie stasie, Dr. G. L. Lombard, in die bosveld gearriveer. Nadat nog vier permanente woonhuise verrys het, kon die goedgekeurde vakatures op die visteelstasie gevul word en die huidige personeel bestaan uit die volgende persone:—

Senior-vakkundige Beampte: Dr. G. L. Lombard.
Assistent-vakkundige Beampte: Mnr. J. D. Venter.
Tydelike Klerk Graad 1: Mnr. K. de la Porté.
1ste Graad Tegniese Beampte: Mnr. K. H. Eins.
Junior Tegniese Beampte: Mnr. L. de la R. de W. Steyn.
Plaasvoorman: Mnr. M. Rabé,
en 30 Bantoearbeiders.

By hierdie navorsingstasie word die aandag tans toegespits op die ekonomies belangrike kurpersoorte, nl. *Tilapia mossambica*, die bloukurper of rooivinkurper en die rooiborskurper, *Tilapia melanopleura*.

[Foto: Denis Garthorne & Co. (Pty.), Ltd., Johannesburg.]
[Photo: Denis Garthorne & Co. (Pty.), Ltd., Johannesburg.]

Produksi edamme van die model visplaas op die laeveldse Visserynavorsingstasie.
Production dams of the model fish farm at the Lowveld Fisheries Research Station.

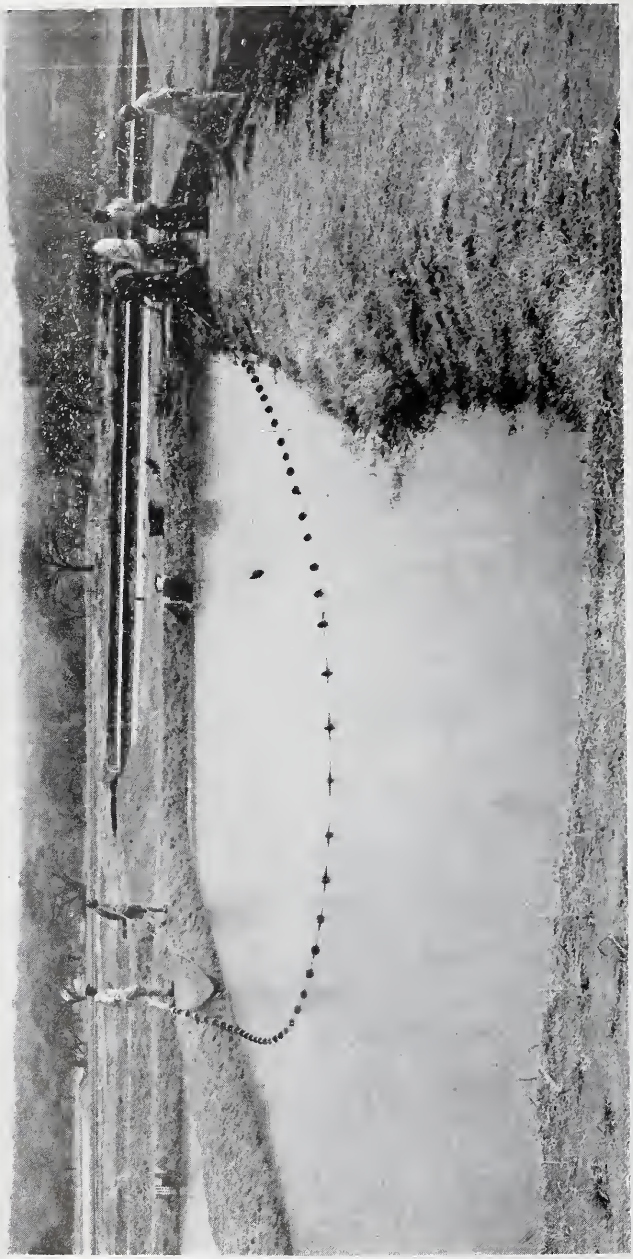
(Photo: Information Service, Dept. of Bantu Administration and Development)
(Foto: Inligtingsdiens, Dept. Bantoe-Administrasie en Ontwikkeling)

Fish being sorted on sorting table. Vis word op sorteertafel sorteer.

In 1955 a second pre-fabricated house and a temporary laboratory with out-buildings were erected and in September of the same year the first Professional Officer of this station, Dr. G. L. Lombard, arrived in the Bushveld. After the addition of four permanent dwellings the approved posts on the fisheries station could be filled and the present staff consists of the following persons:—

Senior Professional Officer: Dr. G. L. Lombard.
Assistant Professional Officer: Mr. J. D. Venter.
Temporary Clerk Grade I: Mr. K. de la Porté.
1st Grade Technical Officer: Mr. K. H. Eins.
Junior Technical Officer: Mr. L. de la R. de W. Steyn.
Farm Foreman: Mr. M. Rabé, and
30 Bantu labourers.

At the research station attention is applied to the kurper or *Tilapia* species which may be of economic value, i.e. *Tilapia mossambica,* the blue or red-finned kurper or bream and the red-breasted kurper or bream, *Tilapia melanopleura.*



'n Produksiedam op die Visserynavorsingstasie word genet.

Netting a production dam at the Fisheries Research Station.

[Foto: Denis Garthorne & Co. (Pty.) Ltd., Johannesburg.]
[Photo: Denis Garthorne & Co. (Pty.) Ltd., Johannesburg.]

To prevent the dams from becoming over-stocked the American Largemouth Black Bass, *Micropterus salmoides* is used as predator. *Tilapia sparrmannii*, the Highveld vleikurper or bream and thoroughbred European carp, *Cyprinus carpio*, are studied for farming in areas where the water is too cold for the first-mentioned species. All the above-mentioned fish are supplied to prospective or existing fish farmers.

The research program is consequently planned to focus attention on a higher production of fish flesh per acre of water.

Amongst others, experiments are conducted to establish the natural productivity of our dams, and to establish the growth of the kurper at various stocking rates. In conjunction with these experiments dams are fertilized with artificial fertilizers, which produce a better growth of the natural fish foods (plankton and benthos) and subsequently enhance the production of a dam. To obtain a still higher yield, the suitability of various artificial foods is tested.

By getting to know more about the feeding habits of fish one can afterwards combine species that eat different foods and would not, therefore, compete with each other. The combination of a predator, which lives on small fish, with the prolific *Tilapia* species, is a necessity without which dams would soon become overpopulated, resulting in retarded growth and the production of small under-nourished fish.

The breeding habits and behaviour of the various kinds of fish has to be studied in order to simulate optimal conditions in the breeding and production dams. Selective breeding is anticipated to enable the improvement and development of our indigenous species as farm products.

A Technical Officer testing the suitability of water for fish production.

'n Tegniese Beampte toets die geskiktheid van water vir die produksie van vis.

Om te verhoed dat die damme oorbevolk raak, word die Amerikaanse Grootbekswartbaars, *Micropterus salmoides*, as roofvis gebruik. *Tilapia sparrmannii*, die hoëveldse vleikurper en opreggeteelde Europese karp, *Cyprinus carpio*, geniet ook ons aandag vir boerdery in waters wat te koud sou wees vir die eersgenoemde soorte. Al die genoemde soorte word ook verskaf aan voorgenome of gevestigde visboere.

(Foto: Inligtingsdiens Bantoe-Administrasie en Ontwikkeling.)
(Photo: Information Service Bantu Administration and Development.)

'n Skepnet vol vis wat geweeg moet word. A scoop-net full of fish to be weighed.

Die navorsingsprogram is dan ook so beplan dat die aandag toegespits is op 'n hoër produksie visvleis per gegewe oppervlakte water.

Hier word onder andere proewe gedoen om die natuurlike vrugbaarheid van ons damme te bepaal en om die groei van kurpers by verskillende bevolkingsdigthede vas te stel. Aansluitend hierby word damme met kunsmis bemes sodat die natuurlike voedsel (plankton en benthos) van die visse beter kan groei en sodoende die visproduksie van die dam kan verbeter. Om nog 'n hoër oes te kry, toets ons die geskiktheid van verskillende kunsmatige voedselstowwe.

Deur meer van die voeding van visse te wete te kom, kan ons dan later vissoorte met mekaar kombineer wat nie dieselfde voedsel eet nie en dus nie met mekaar sal meeding nie. Die kombinasie van 'n roofvis, wat klein vissies eet, met die kurpersoorte, is ook belangrik omdat die kurpers so geweldig aanteel dat die damme daarsonder gou oorbevolk sou raak en die vis nie so goed sal groei nie.

(Photo: Information Service Bantu Administration and Development.)
(Foto: Inligtingsdiens Bantoe-Administrasie en Ontwikkeling.)

Tilapia being weighed before they are put into the marketing ponds.

Kurpers word geweeg voordat hulle na die bemarkingsdamme gaan.

Die broeigewoontes en leefwyse van die verskillende vissoorte moet ook bestudeer word ten einde in die broei- en produksiedamme die optimale toestande te kan skep vir die onderskeie soorte. Selektiewe teelt word beoog vir die verbetering en ontwikkeling van ons inheemse vissoorte as plaasproduk.

Die ondersoek van verskillende oes- en bemarkingsmetodes en die voorbereiding van vis vir bemarking, maak ook deel van ons werk uit. Verder bestudeer ons vissiektes en parasiete wat miskien voorkom en word navorsing gedoen in verband met hulle bestryding.

In samewerking met die Departement van Bantoeontwikkeling en met private boere, word veldproewe ook in verskeie dele van Transvaal uitgevoer om ons eksperimente onder verskillende klimaatstoestande uit te toets.

Aspirant- en gevestigde visboere word ook voortdurend deur ons met raad en advies bedien, sodat hierdie nuwe rigting in die landbou op 'n gesonde voet kan ontwikkel.

By die Laeveldse navorsingstasie is daar ook 'n model visplaas waar ons eksperimentele resultate op 'n groter skaal toegepas word. Hier kan visboere dan ook sien hoe 'n visboerdery in die praktyk aangepak moet word. Die surplus vis wat hier geproduseer word, word aan verbruikers verkoop en die aanvraag is bo alle verwagting—selfs so groot dat ons reeds by 'n paar geleenthede al ons beskikbare tafelvis verkoop het.

Van 1955 tot 1959 is 4,875 *T. mossambica,* 4341 *T. melanopleura,* 6,100 *T. sparrmannii,* 5,000 karp en 5,013 Grootbekswartbaars van Marble Hall af versprei. Altesaam 6,855 pond tafelvis is van 1957 af verkoop om as voorspys of hoofgereg die smaak van fynproewers te bevredig.

The study of various cropping and marketing methods and the preparation of fish for the market also forms part of our work. Furthermore, we examine fish diseases and parasites which may occur and research is carried out in connection with their control.

In collaboration with the Department of Bantu Development and with private farmers, field experiments are carried out in various parts of the Transvaal to test our experiments under different climatic conditions.

Prospective and established fish farmers are continuously served with advice in order that this new direction in agriculture can develop on a sound basis.

At the Lowveld Fisheries Research Station we have a model fish farm where our experimental results are put into practice on a larger scale. It is here that fish farmers can see how fish farming should actually be tackled. The surplus fish produced is sold to consumers and the demand is beyond expectation—so great that we have on occasion run out of marketable fish.

From 1955 to 1959 the following numbers of fish have been supplied to farmers from Marble Hall:—

> *T. mossambica,* 4,875; *T. melanopleura,* 4,341; *T. Sparrmanii,* 6,100; Carp, 5,000 and Largemouth Black Bass, 5,013. Since 1957 we have sold a total of 6,855 lbs. of table fish to tempt the palates of connoisseurs.

'N VOORLOPIGE HANDLEIDING VIR VISBOERDERY IN TRANSVAAL

deur dr. G. L. Lombard

INLEIDING.

DIE rol wat die produksie van varswatervis in 'n land se ekonomie kan speel, hang van verskeie omstandighede af. In digbevolkte tropiese lande waar die lewensstandaard laag is en gewoonlik ook 'n tekort aan proteïne ondervind word, speel visboerdery 'n vername rol. Dit pas ook goed in by intensiewe landboupraktyke waar elke stukkie grond benut moet word soos byvoorbeeld in Europa. Hier word die grond wat weens moerasagtigheid of lae vrugbaarheid vir landbou ongeskik is, vir visboerdery gebruik. In Israel, waar landbou ook baie intensief beoefen word, gebruik hulle weer die brak gronde. Groot gebiede in Tropiese Afrika, waar die tsetsevlieg voorkom, is vir veeboerdery ongeskik, met die gevolg dat die bevolking 'n tekort aan eiwitte in hulle dieet ondervind. Dit het aanleiding gegee tot 'n groot veldtog om die inheemse bevolkings se belangstelling in visboerdery op te wek, omdat dit die enigste manier is om die tekort aan te vul.

Die afstand van die see bemoeilik die distribusie van seevis in Transvaal, met die gevolg dat hier 'n goeie vraag na varswatervis bestaan. Die aanbod is tans maar egter beperk; in 1958 is slegs 22½ ton varswatervis in die Provinsie te koop aangebied.

Visboerdery moet, om tot sy reg te kom, inpas by 'n gemengde boerdery. Die boer wat sy plaas reeds intensief bewerk, kan daardie dele wat vir landbou nutteloos is onder water sit en dit sodoende produktief maak. As die boer in elk geval van plan was om 'n dam te bou, kan hy deur die aanwysings in hierdie handleiding te volg, dit met min moeite so verander dat dit ook vir vis gebruik kan word. Selfs die reeds bestaande plaasdam van meer as ¼ akker (1,200 vk. jaarts) kan met 'n bietjie aandag 'n gereelde oes van vars vis lewer.

Intensiewe visboerdery is nie orals moontlik nie en meeste boere sal die beste moet maak van hulle bestaande damme en watervoorrade. Vir sulke boere is daar 'n spesiale afdeling aan die end van hierdie handleiding.

Die gegewens wat hieronder verstrek word, is deels gebaseer op bestaande literatuur, maar hoofsaaklik op werk wat gedoen is op die Laeveldse Visserynavorsingstasie te Marble Hall, waar eksperimentele visboerdery reeds die afgelope vier jaar beoefen word. Dit is onmoontlik om in so 'n kort handleiding alle inligting te verstrek en lesers word verwys na die literatuurlys agterin en aangeraai om vir enige nadere inligting aan die genoemde navorsingstasie te skrywe.

In 'n droë land soos ons s'n is die eerste vraag in hierdie verband: „Water?" En as mens oor water beskik: „Watter soort water en vir watter soorte vis is hierdie water geskik?" Wat visboerdery betref, kan die Transvaal in drie soorte gebiede verdeel word: naamlik Laeveld, die Platorand en dan die Hoëveld. Die soort vis waarmee mens kan boer, sal deur die gebied waarin die boerdery geleë is, bepaal word.

A PRELIMINARY GUIDE TO FISH FARMING IN THE TRANSVAAL

by **Dr. G. L. Lombard**

INTRODUCTION.

THE role which the production of freshwater fish plays in a country's economy depends on various factors. In densely populated tropical countries, where a low standard of living prevails and a protein deficiency in the diet exists, fish-farming plays an important part. It also fits in well with intensive agricultural practices as in parts of Europe where every inch of ground is cultivated. Here the marshy or infertile land which is unsuitable for agriculture, is used for fish-farming. In Israel, where agriculture is also practised intensively, the brackish soils are used for the same purpose. Large areas of tropical Africa, where the tsetse fly occurs, are unsuitable for livestock farming, with the result that the diet of the population is deficient in protein. This has instigated a large campaign to develop the interest of the indigenous people in fish-farming as the only way to augment this deficiency.

The distance from the sea limits the distribution of sea fish in the Transvaal, resulting in a good demand for freshwater fish. The supply as yet is, however, very limited; in 1958 only 22½ tons of freshwater fish were offered for sale in this Province.

Fish-farming fits in well with mixed farming. The farmer who already works his farm intensively can put those parts unsuitable for agriculture under water and make them productive in this way. If the farmer intends to build a dam in any case, he can, by following the instructions in this manual, with a minimum of trouble design it so that it can also be used profitably for fish. Even the existing farm dam of more than ¼ acre (1,200 sq. yds.) can, with a little attention, produce a regular crop of fresh fish.

Intensive fish-farming is not possible everywhere and most farmers will have to make the best of their existing dams and water supply. For those farmers there is a special section at the end of this booklet.

The data given below are partly based on existing literature, but mainly on work done at the Lowveld Fisheries Research Station, Marble Hall, where experimental fish-farming has been in progress for the past four years. It is impossible to give all the information in such a short guide as this and readers are referred to the literature cited at the end and are advised to write to the above research station for any further information.

In a dry country like ours, the first question regarding fish farming is: " Water? " Being in possession of water, the next question would be: " What type of water and for which kinds of fish would it be suitable? " As far as fish-farming is concerned, the Transvaal can be divided into three regions, viz. the Lowveld, the Eastern Escarpment and the Highveld. The type of fish will depend on the region in which the farm is situated. Where water has to be pumped into a dam we do not recommend fish-farming, as the cost of production will be so high that the venture will not be profitable.

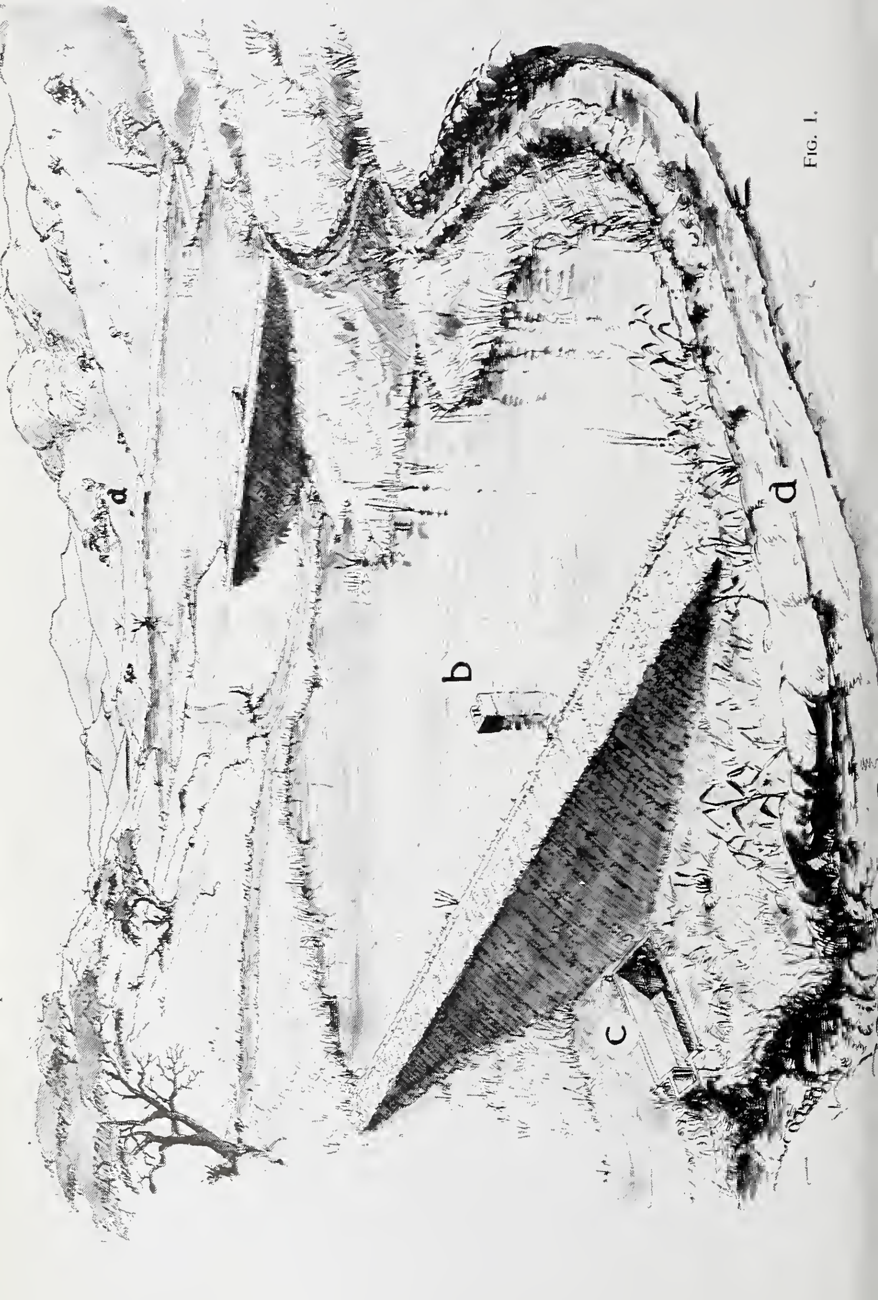


FIG. 1.

Visproduksiedamme onder mekaar in 'n vallei gebou. a—Stormwaterkanaal; b—Uitlaattoring; c—Vangbak.
Fish production dams built below each other in a valley. a—Flood-water canal; b—Monk; c—Trap.

I should like to thank Mr. L. de la R. de W. Steyn, Junior Technical Officer at the Fisheries Research Station near Marble Hall for the illustrations and the cover design.

CONSTRUCTION AND MAINTENANCE OF DAMS.

Dams.—Concrete reservoirs are unsuitable for fish-farming on account of their small size and infertility. Earthern dams or dams with at least an earthern floor are the most suitable for the production of fish. Before dams can be built, the nature of the soil should be taken into consideration; on account of its permeability, sandy or gravelly soil should be avoided.

Two types of dams may be constructed for fish-farming, the choice of which will depend on the site and on the water supply. If there is a valley or a vlei, a series of dams can be built below one another as in Fig. 1. In a construction like this, flood water should always be kept in mind and the flood water canal (Fig. 1 a) should be large enough to divert all storm water in the rainy season. In drier parts of the country this type of dam is also very beneficial, because the water of the upper dams can be re-used in the lower ones.

The slope of the dam wall also depends on the type of soil with which it is built; usually the inside slope is 1:3 and 1:2 on the outside. It will be noticed that each dam wall or weir in Fig. 1 has a monk or outlet (*b*) and a trap (*c*). Detail sketches of these constructions are given in Figs. 3—7.

The second type of dam which is more suitable than the first is depicted in Figs. 2 A and B. A rectangular dam is very practical because it nets easily and the maintenance of the floor and walls of the dam is easier than in the previous type. The greatest advantage is the fact that the water for such a dam is brought by canal along a contour and that the dam is not located in a valley where flood water can do any damage.

If the ground on which the dam is built is porous, it could be remedied by digging a trench as wide as the crest of the proposed wall, down to solid rock or impermeable earthen layer. The trench is then half-filled with water and a good loam or clay mixed into the water with poles. This method of puddling forms a watertight core which prevents seepage. Kikuyu grass is a good binding medium to plant on the completed dam walls.

If the monk is located in the corner of the dam as in Fig. 2 A, the trap can be placed in such a position as to serve two dams at the same time. The deepest part of the dam must be at the monk and not deeper than the floor of the monk to prevent the fish from being stranded on the bottom when the dam is emptied.

From the inlet of the dam to its deepest point, a bottom canal must be dug to enable fresh water to be let through when the fish are being reaped.

For farming with kurper and black bass, oblong half-acre ponds (approx. 84 ft. × 260 ft.) are the most practical. The depth of the dams should increase from not less than 2 ft. 6 inches to not more than 5 ft. When the slope of the bottom is too great there is danger of silting up at the monk, therefore, the lesser the slope the better. In dams with a very slight incline of the bottom, more attention should be given to the construction of the bottom canal in order that the fish can collect in this canal instead of being left on the dam floor when the dam is emptied.

Indien water vir 'n dam gepomp moet word, beveel ons nie visboerdery aan nie, omdat die koste hierdeur baie opgestoot word en die onderneming gevolglik nie lonend sal wees nie.

Graag wil ek mnr. L. de la R. de W. Steyn, Junior Tegniese Beampte van die Visserynavorsingstasie vir die sketse in hierdie handleiding en vir die ontwerp van die buiteblad bedank.

KONSTRUKSIE EN ONDERHOUD VAN DAMME.

Damme.—Sementdamme is nie geskik vir visboerdery nie omdat hulle te klein en onvrugbaar is. Gronddamme of damme met ten minste 'n grondbodem is die doeltreffendste vir die produksie van vis. Voordat damme gebou kan word, moet die geaardheid van die grond nagegaan word; sanderige of baie gruisagtige grond sal weens die waterdeurlaatbaarheid daarvan nie geskik wees nie.

Daar is twee soorte damme wat vir visboerdery geskik is, die keuse waarvan sal afhang van die terrein waarop die damme geleë sal wees en die watervoorsiening. As mens 'n klein vallei of vlei het, kan 'n reeks damme, soos in fig. 1, onder mekaar gebou word. In hierdie geval moet stormwater in gedagte gehou word en sal sorg gedra moet word dat die stormwaterkanaal (fig. 1, a) groot genoeg is om al die oortollige water in die reëntyd weg te voer, sodat die oes nie wegspoel nie. Hierdie tipe dam is ook voordelig in droë streke, waar mens die water van die boonste damme weer in die onderstes kan gebruik.

Die helling van die damwal sal ook bepaal word deur die soort grond waarmee dit gebou word; gewoonlik is die binneste helling 1:3 en die buitenste 1:2. Elke damwal op fig. 1 is voorsien van 'n uitlaattoring (*b*) en 'n vangbak (*c*). Detail sketse van hierdie konstruksies word aangegee op figure 3—7.

Die tweede soort dam, wat meer geskik is as die eerste, word aangegee in figure 2 A en B. 'n Reghoekige dam soos hierdie is meer prakties omdat mens maklik met 'n net daarin kan werk, en die bewerking van die dambodem en walle eenvoudiger is as in die vorige tipe. Die grootste voordeel is natuurlik dat water vir hierdie soort dam met 'n kanaal langs 'n kontoer gebring word en dat die dam nie in 'n vallei, waar stormwater skade kan aanrig, lê nie.

Indien die grond waarop die dam gebou word poreus is, kan die dam waterdig gemaak word deur 'n sloot, so breed as die kruin van die voorgestelde wal te grawe tot op die onderste rotslaag of ondeurlaatbare grondlaag. In dié sloot laat mens water loop en goeie leem of kleigrond moet dan met pale in die water geroer word om 'n pap modder te vorm; hierdeur ontstaan 'n waterdigte kern wat deursyfering verhoed. Kikuyugras is 'n goeie bindmedium om op die voltooide walle te plant.

As die uitlaattoring soos in fig. 2 A in die hoek van 'n dam gebou word, kan mens die vangbak so plaas dat dit vir twee damme gelyktydig diens doen. Sorg moet gedra word dat die diepste punt van die dam net voor en nie dieper as die vloer van die toring is nie, sodat vis by die leegmaak van die dam nie op ander plekke op die dambodem agterbly nie.

Vanaf die inlaat van die dam na die diepste punt moet daar 'n bodem-kanaaltjie gegrawe word om vars water in te laat as mens met die vis werk.

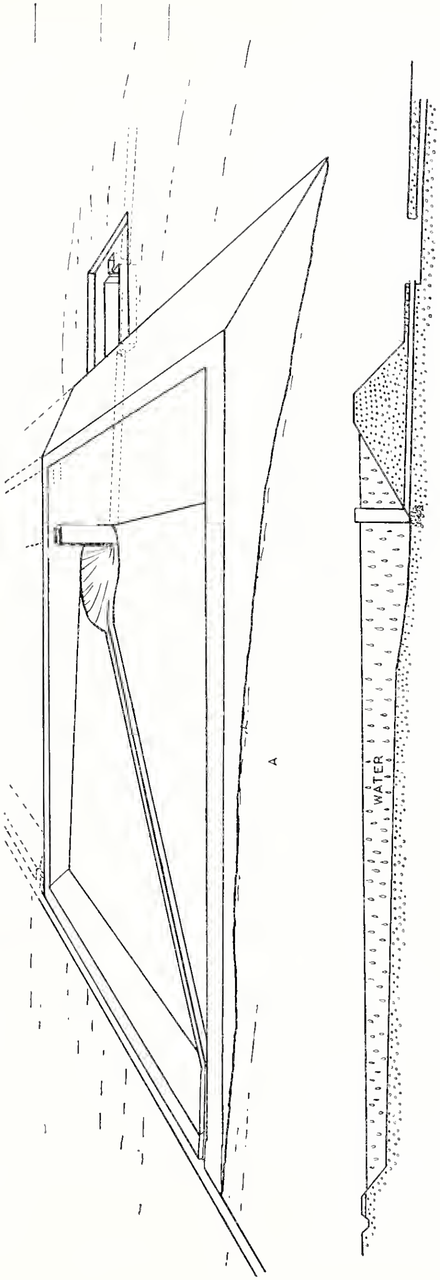


Fig. 2.

A—A rectangular fish production dam.
B—Section through dam from inlet to monk.

A—'n Reghoekige visproduksiedam.
B—Seksie deur dam van inlaat na uitlaattoring.

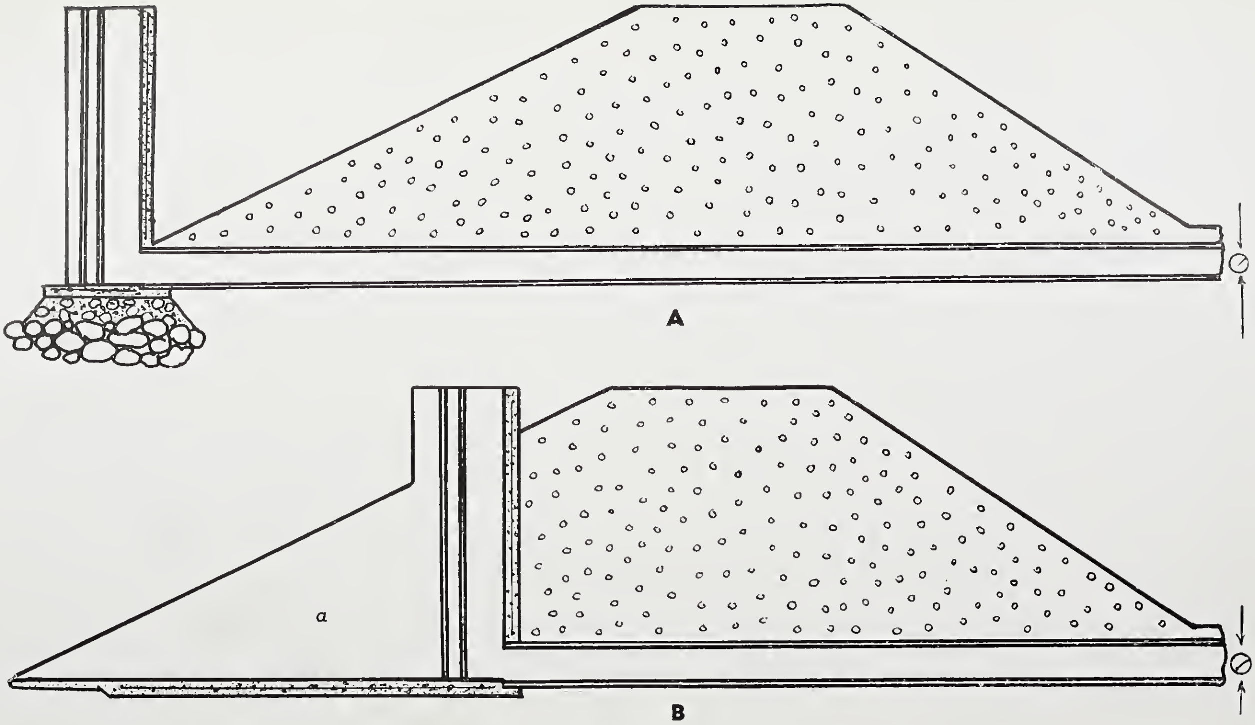
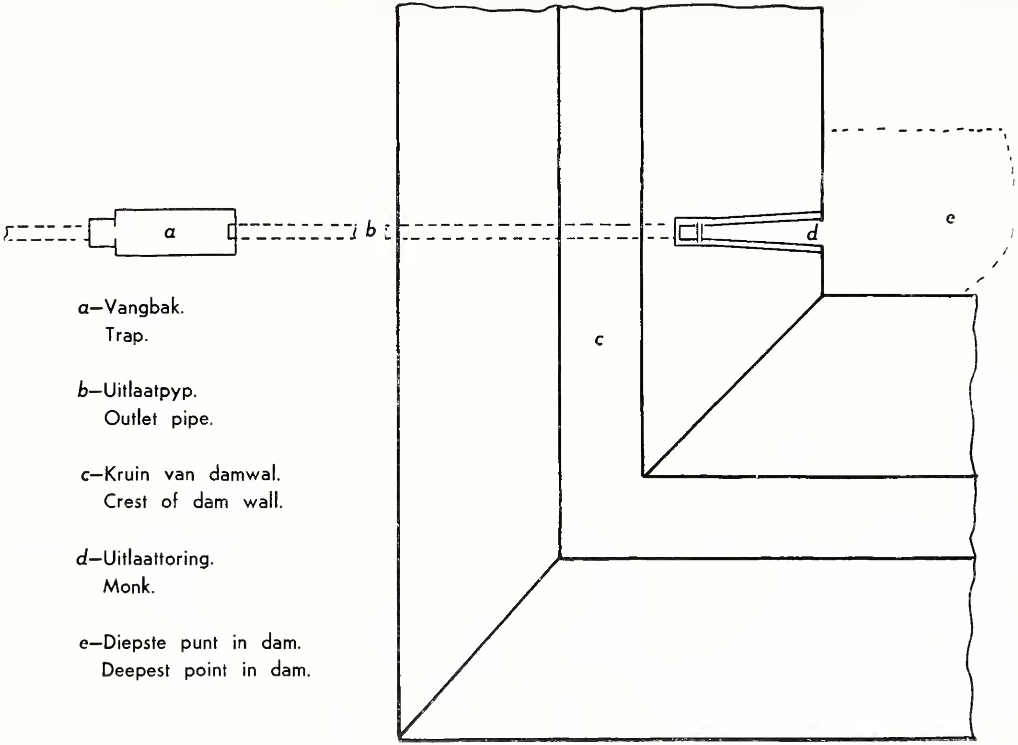


FIG. 3.

A—Seksie van uitlaattoring los van damwal binne in dam.
B—Seksie van uitlaattoring in damwal gebou.

A—Section of a monk at toe of dam wall inside dam.
B—Section of a monk built in the dam wall.



a—Vangbak.
Trap.

b—Uitlaatpyp.
Outlet pipe.

c—Kruin van damwal.
Crest of dam wall.

d—Uitlaattoring.
Monk.

e—Diepste punt in dam.
Deepest point in dam.

FIG. 4.

Plan of the corner of a dam with the monk built into the dam wall as in Fig. 3B.

Plan van die hoek van 'n dam met die uitlaattoring in die damwal gebou soos in fig. 3B.

Vir kurper en swartbaars is langwerpige half-akker damme van byvoorbeeld 84 vt.×260 vt. die beste. Die vlakste deel van die dam moet nie vlakker as 2 vt. 6 dm. wees nie en die uitlaat 5 vt. As die helling van die dambodem te steil is, kan dit verslikking by die uitlaattoring veroorsaak; hoe geringer die val van die bodem is, hoe beter. Waar die vloer van die dam 'n baie geringe val het, moet meer aandag aan die bou van die bodem-kanaal geskenk word, sodat die vis in die kanaal versamel en nie op die dambodem bly lê as die dam leeggemaak word nie.

Uitlaattorings.—Syaansigte van die twee soorte uitlaattorings word afgebeeld op fig. 3, A en B. Die torings word uit gewapende beton gegiet en 'n stewige fondament moet gegiet word om die gewig van die toring te dra. Die toring op fig. 3 A is dieselfde as in fig. 1 en staan los van die damwal binne in die dam; dit is ook die goedkoopste tipe om te bou. Sommige mense verkies hierdie los toring omdat dit nie sonder 'n brugplankie soos in fig. 1 aangetoon, bereik kan word nie en daar dus nie maklik mee gepeuter kan word nie. Dit het natuurlik ook die nadeel dat mens altyd 'n bruggie moet hê om die toring te bereik vir kontrole of leegmaak van die dam, en dat dié tipe toring dikwels in die pad kan wees as mens net.

Die tweede tipe toring (fig. 3 B) is natuurlik makliker bereikbaar, maar die noodsaaklikheid van die bou van vlerke verhoog die boukoste daarvan. Die voordeel van hierdie toring, behalwe dat dit makliker bereikbaar is, is dat die toringplanke en siwwe direk van die damwal af hanteer kan word. Hierdie tipe toring is ook nie hinderlik as 'n mens 'n dam moet net nie.

Die toring is met 'n vangbak verbind deur 'n betonpyp met 'n deursnee van 10 tot 12 dm. Die val in hierdie pyp is 1 dm. op elke 5 vt.

Fig. 4 is 'n plan van die hoek van 'n dam met 'n tipe „3 B" toring. In fig. 5 word 'n plan en in fig. 6 'n skuins vooraansig van die toring afgebeeld. Die groewe in die toring is vir die toringplanke en sif (fig. 9). Die buitenste mate van die groef is 1½ dm. en dit loop aan die een kant skuins binnetoe sodat dit op sy diepste punt 1¼ dm. wyd is. Die diepte van die groef moet 1½ dm. wees.

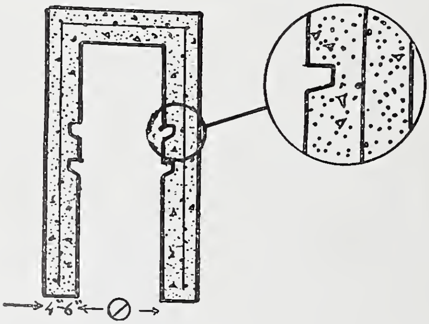


FIG. 5.

Plan van 'n uitlaattoring om groewe vir toringplanke en dryfplank of siwwe aan te toon.

Plan of a monk to show grooves for sluice-planks and of floating plank or screens.

Outlets or Monks.—Side views of the two types of monks are shown in Figs. 3, A and B. These are constructed of reinforced concrete and a strong foundation should be cast to carry the weight of the monk. The outlet on Fig. 3 A is of the same type as in Fig. 1 and stands away from the dam wall inside the dam; this is the cheapest construction of the two. Some people prefer this type of outlet because it cannot be reached without a gangway and the monk is in this way protected from interference. The disadvantages, however, are that one needs a gangway to reach the monk for control or emptying of the dam; this type of outlet can also be a hindrance when the dam is being netted.

The second type of monk (Fig. 3, B) is more easily reached, but the necessity for building "wings" (*a*) increases building costs. The advantage of this monk, apart from being more accessible, is that the sluice planks and screens can be handled directly from the dam wall. In addition, this type of outlet is never a hindrance in netting operations.

The monk is connected to the trap outside the dam by a concrete pipe of 10 to 12 in. in diameter. The best slope for this pipe is 1 in. to every 5 ft.

Fig. 4 is a plan of the corner of a dam with a type "3, B" outlet. In Figs. 5 and 6 a plan and a semi-front view of the monk are given. The grooves in the monk are for the sluice planks and screens (Fig. 9). The outside measurement of the groove is $1\frac{1}{2}$ in. and the one side slopes inwards so that the groove is $1\frac{1}{4}$ in. at its deepest point. The depth of the groove should be $1\frac{1}{2}$ in.

The sluice planks (Fig. 9, E.) made out of 1 in. planks to fit loosely into the grooves, have a hole on one side into which the hook (Fig. 9, C.) can be inserted to raise the planks. This hole should not be deeper than half the thickness of the plank itself, and should slant slightly upwards.

To fill a dam, the sluice planks with the holes facing the wall of the dam, should be inserted into the outer groove of the monk up to the desired water level. A very loose-fitting floating plank should be placed in the inner groove and a few handfuls of sawdust thrown between the latter and the sluice planks. The water can now be let in. As the water increases the floating plank will rise, preventing the sawdust from floating away over the entire water surface. Where the water seeps through between the sluice planks, the current will carry in some of the sawdust which will, through swelling, stop the leak. One has, therefore, to replenish the sawdust from time to time until the dam has been filled. Should a leak occur from a bump against the sluice planks or other cause, a few handfuls of sawdust thrown between the latter and the floating plank will soon stop the leak. The water level must never be higher than two feet from the top of the wall.

In new and especially in large dams, grass can be packed along the highwater-mark to protect the wall from damage by wave-action.

The Trap.—A side view and plan of the trap are shown on Figs. 7, A and B. This concrete construction at the outer base of the dam wall should always be lower than the deepest part of the dam. It is important to note that the pipe inlet of the trap (Fig. 7 A, a), should be at least six inches above the floor of the trap to enable the screening box (Fig. 10) to be shifted under and to fit around this pipe. The outlet of the trap must be provided with a groove to take sluice planks for controlling the water level in the trap.

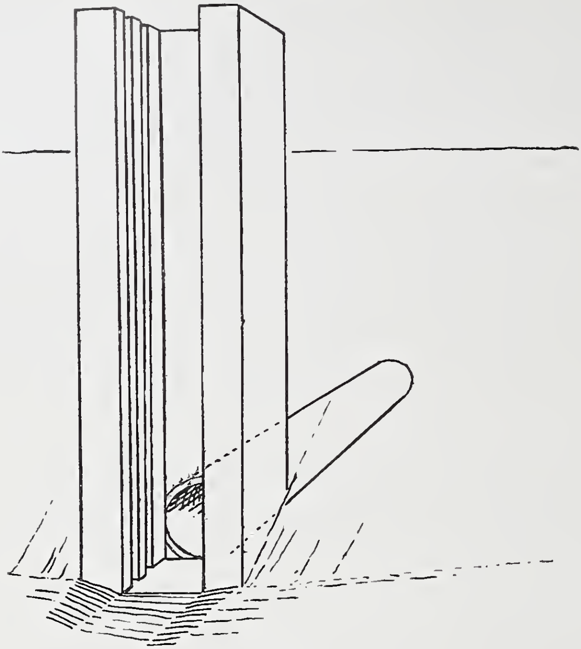


FIG. 6.

Skuins vooraansig van 'n uitlaattoring van die binnekant van 'n dam gesien.

Semi-front view of a monk as seen from the inside of a dam.

Die toringplanke (fig. 9, E) wat van 1 dm. planke gemaak is om taamlik los in die groewe te pas, het aan die eenkant 'n gaatjie waarin mens die hak (fig. 9, C) kan steek om die planke uit te trek. Hierdie gaatjie moet nie dieper as die helfte van die plankdikte wees nie en effens skuins boëntoe loop.

Om die dam te vul moet die toringplanke met die gaatjies weg van die waterkant in die buitenste gleuf gesit word tot op die verlangde hoogte. In die binnenste gleuf kom 'n los dryfplankie en tussen laasgenoemde en die toringplanke word 'n paar handevol saagsel gegooi. Die water kan dan ingelaat word. Namate die water styg, dryf die dryfplank omdat dit baie los is, ook hoër en verhoed dat die saagsel oor die hele wateroppervlakte versprei. Waar die water tussen die toringplanke deurlek, suig dit van die saagsel in, laasgenoemde swel en blokeer die lekkasie. Van tyd tot tyd moet daar dus nuwe saagsel bygegooi word totdat die dam vol water is. Indien daar deur 'n stamp aan die planke of so iets weer 'n lek kom, kan 'n paar handevol saagsel weer tussen die dryf- en toringplanke gegooi word om dit te seël. Die watervlak moet nooit hoër as twee voet onder die kruin van die wal kom nie. In nuwe en veral groot damme kan gras langs die hoogwatermerk gepak word om te verhoed dat die golfslag skade aan die walle doen.

Arrangement of Dams.—To farm with kurper or carp, one should have at least two dams. The ideal is a series of dams divided into the following categories:—

1. *Breeding Ponds.*—For kurper an ordinary half-acre dam can be used for breeding. When the fry starts swimming around in shoals, fresh water should be let into the dam; the small fish tend to swim " upstream " and gather around the inlet in great numbers. They can then easily be netted and transferred to the nursery ponds. Carp need a special type of breeding pond which will be described later.

2. *Nursery Ponds.*—For this purpose shallow ponds of half-an-acre to two acres and 2 to 3 feet deep are the most suitable. These ponds should be well fertilized and cultivated to ensure an abundance of natural food for the small fish.

3. *Production Ponds.*—These dams are used to rear the fish to marketable size, and may be from half an acre to two acres in size.

4. *Marketing Ponds.*—These dams need not be larger than 75 ft. by 30 ft. with a depth of 3 ft. or 4 ft. 6 in. The marketable fish should be sorted according to size and species and placed in these ponds from which they can be marketed.

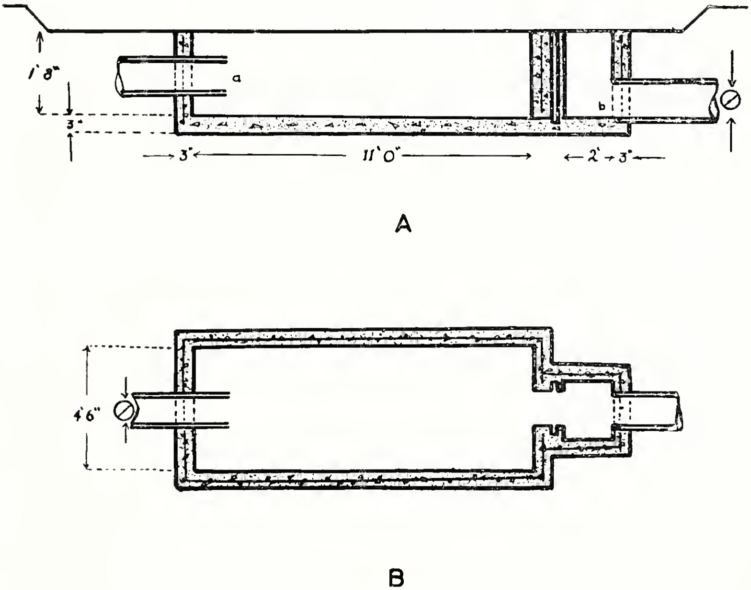


Fig. 7.

Trap. A—Side view; a—inlet; b—outlet. B—Plan.

Vangbak. A—Syaansig; a—inlaatpyp; b—uitlaatpyp. B—Plan.

Die vangbak.—'n Syaansig en plan van die vangbak kan op fig. 7, A en B gesien word. Hierdie betonbak aan die buitenste voet van die damwal moet laer wees as die diepste punt in die dam. Daarop moet gelet word dat die inlaatpyp van die vangbak wat van die toring af kom (fig. 73, a), minstens ses duim bokant die vloer van die vangbak inkom, sodat die sifkas (fig. 10) onder die pyp ingeskuif kan word. Aan die uitlaatkant van die vangbak moet daar 'n gleuf gemaak word waarin toringplanke sal pas sodat die waterhoogte in die vangbak gereguleer kan word.

Indeling van damme.—As mens met kurpers of karp wil boer moet jy minstens oor twee damme beskik. Die ideale toestand is natuurlik 'n reeks damme wat as volg ingedeel word:—

1. *Broeidamme.*—Vir kurpers kan 'n gewone halfakkerdam vir die doel gebruik word. Nadat die klein vissies in skole rondswem, word varswater in die dam gelaat; die kleintjies swem dan „stroomop" en kom in groot getalle om die inloop voor. Hier kan hulle met 'n fyn net gevang word vir oorplasing na die voorstrekdamme. Karp het 'n spesiale soort dam nodig soos later beskryf sal word.
2. *Voorstrekdamme.*—Hiervoor is vlak damme van half- tot twee akker en 2 tot 3 vt. diep baie geskik. Die damme moet baie goed bemes en bewerk word sodat 'n hoë persentasie natuurlike voeding aanwesig sal wees.
3. *Produksiedamme.*—In hierdie damme word die vis grootgemaak tot bemarkbare grootte. Sulke damme kan wissel van 'n halfakker tot twee akker in grootte.
4. *Bemarkingsdamme.*—Die dammetjies hoef nie veel groter as 75 vt. by 30 vt. of dieper as 3 vt. of 4 vt. 6 dm. te wees nie en die bemarkbare vis word in verskillende groottes en soorte hierin vir bemarking gehou.

Die persentasie van die totale oppervlakte van 'n visboerdery wat deur elke soort dam beslaan word, verskil by verskillende soorte vis. Vir kurpers waar die vis eers in die derde jaar bemarkbaar is, word die produksiedamme onderverdeel in strekdamme of grootmaakdamme vir die eerste twee jaar en word die derdejaardamme, produksiedamme genoem. Die verhouding van die verskillende soorte damme in 'n kurperboerdery word as volg aanbeveel:—

Broeidamme........	9·25	persent van totale wateroppervlak	1ste jaar.
Voorstrekdamme....	2·75	persent van totale wateroppervlak	
Grootmaakdamme I.	10·00	persent van totale wateroppervlak	
Grootmaakdamme II	26·00	persent van totale wateroppervlak,	2de jaar.
Produksiedamme....	59·00	persent van totale wateroppervlak	3de jaar.
Bemarkingsdamme..	1·00	persent van totale wateroppervlak	

Waar die Aischgrund karp in Suid-Afrika binne 'n jaar bemarkbaar is, is die indeling van die damme heeltemal anders as in Europa en word die volgende verhoudings aanbeveel:—

Broeidamme........	0·1	persent van totale wateroppervlak.
Voorstrekdamme....	2·9	persent van totale wateroppervlak.
Produksiedamme....	96·00	persent van totale wateroppervlak.
Bemarkingsdamme..	1·00	persent van totale wateroppervlak.

The percentage of the total water surface of a fish-farm comprised by each type of pond, differs in the various kinds of fish-farming. For *Tilapia*, where the fish are only marketable in their third year, the production ponds must be subdivided into rearing ponds for the first and second years and we then refer to the third year ponds as production ponds. In *Tilapia* farming the following arrangement of ponds is recommended:—

Breeding ponds.....	0·25	per cent of total water surface	1st year.
Nursery ponds......	2·75	per cent of total water surface	
Rearing ponds I.....	10·00	per cent of total water surface	
Rearing ponds II....	26·00	per cent of total water surface	2nd year.
Production ponds...	59·00	per cent of total water surface	3rd year.
Marketing ponds....	1·00	per cent of total water surface	

The Aischgrund carp which attains a marketable size within a year in South Africa, calls for quite a different arrangement of ponds than it does in Europe. The following ratio is recommended:—

Breeding ponds.....	0·1	per cent of total water surface.
Nursery ponds......	2·9	per cent of total water surface.
Production ponds...	96·00	per cent of total water surface.
Marketing ponds....	1·00	per cent of total water surface.

ADDITIONAL APPARATUS AND IMPLEMENTS.

Nets.—(*a*) *Seine Nets* with or without a bag are used in the handling of fish. The depth of the net should be one and one quarter times as deep as the deepest part of the dam, and the length should be one and a half times the width of the dam to be netted. For oblong dams the nets therefore need not be very long.

Although such a net is expensive and heavy, one with a small mesh of ½ in. to ¾ in. (knot to knot) is the most practical, because both small and large fish can be caught with it. In nets with a larger mesh, the smaller fish are enmeshed behind their gills and may be severely injured.

A small seine net for handling fry and fingerlings in breeding and nursery ponds can be made out of mosquito-netting. Owing to their very small size, carp fry should be handled with a seine made out of cheese-cloth.

(*b*) *Casting net.*—A small round casting net (Fig. 8) as is used in the Far East and along our coast for catching bait, is very handy for taking a few fish from a dam without disturbing the rest.

(*c*) *Scoop nets* for handling the fish can be made as illustrated in sketches A and B of Fig. 9. It should be noted that the frames of the nets are double to protect the netting material. The most practical size for scoop nets are frames of 18 in. in diameter with handles of 54 in. The round net is used to scoop fish out of a seine net or drums, and the net with the flat end to scoop fish from screening boxes of from marketing tanks.

BYKOMSTIGE APPARAAT EN GEREEDSKAP.

Nette.—(*a*) *Treknette,* met of sonder 'n sak word in die hantering van vis gebruik. Die diepte van die net moet een en 'n kwart maal so diep wees as die diepste deel van die dam en die lengte minstens een en 'n half maal die breedte van die dam wat genet moet word. As mens dus langwerpige damme het, hoef die nette nie so oneindig lank te wees nie.

Hoewel so 'n net duurder is en swaarder trek, is 'n net met 'n $\frac{1}{2}$ tot $\frac{3}{4}$ dm. maas (knoop tot knoop maat) die nuttigste, omdat klein sowel as groot vis daarmee gevang kan word. Met 'n groter maas gaan die kleiner vissies deur die net en dié wat effens te groot is, hak agter hulle kiewe vas waardeur mens groot verliese kan ly.

'n Klein treknetjie vir die hantering van die baie jong vissies kan van muskietnet gemaak word. Baie jong karp is so klein dat hulle met 'n kaasdoeknetjie hanteer moet word.

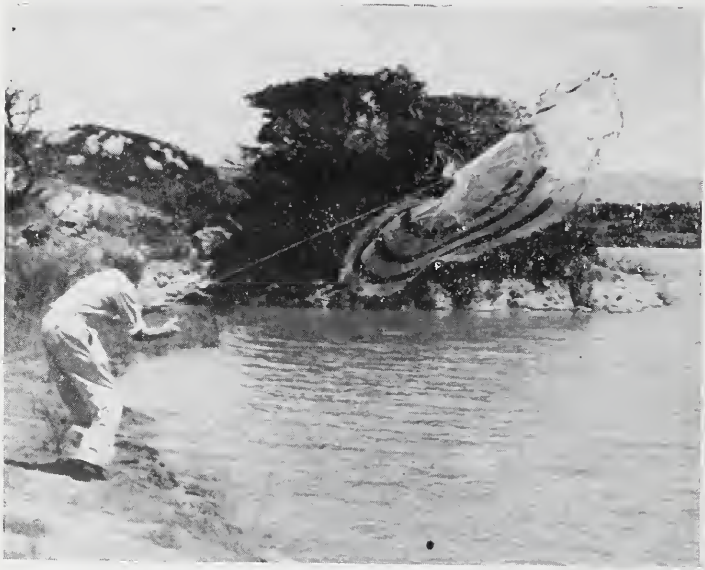


FIG. 8.
Gooinet in gebruik tydens 'n veldopname.
Casting net being used during a field survey.

(*b*) *Gooinet.*—'n Klein ronde gooinet (fig. 8) soos in die Ooste en soms langs ons kus vir aasvang gebruik word, is baie handig waar net 'n paar vis uit 'n dam gehaal moet word, sonder om die ander vis te steur.

(*c*) *Skepnette* om die vis mee te hanteer kan gemaak word soos aangedui op die afbeeldings A en B op fig. 9.

The Screening Box.—This rectangular box (Fig. 10, A) of angle iron and wood has a wooden floor and sides of perforated iron with holes of $\frac{1}{12}$ in. The front and back walls have grooves to take the planks fitting around the inlet pipe and the back sliding door. The outside measurements of the screening box should be slightly narrower than the trap to enable the box to be put into the trap without any difficulty and the box should be at least a foot shorter than the trap so that it can easily be shifted under the outlet pipe of the pond. After the box has been slipped into position two wooden blocks should be forced between the box and the far end of the trap to keep it secure and to prevent it from shifting during harvesting operations. To prevent fish from jumping over the sides, the box should extend at least one foot above the top of the trap.

Sorting Table.—A sorting table with a 9-in. upright wooden edge with openings on three sides, can be made of asbestos-cement or plexiglass. The table-top has a very smooth surface to minimise friction and subsequent injury to the fish being sorted. If the table is made to rest on loose trellises instead of having fixed legs as in Fig. 10 B. it can be moved more easily from one dam to another.

The openings in the sides of the table should be provided with flaps or sliding doors in order that they can be opened or closed as required.

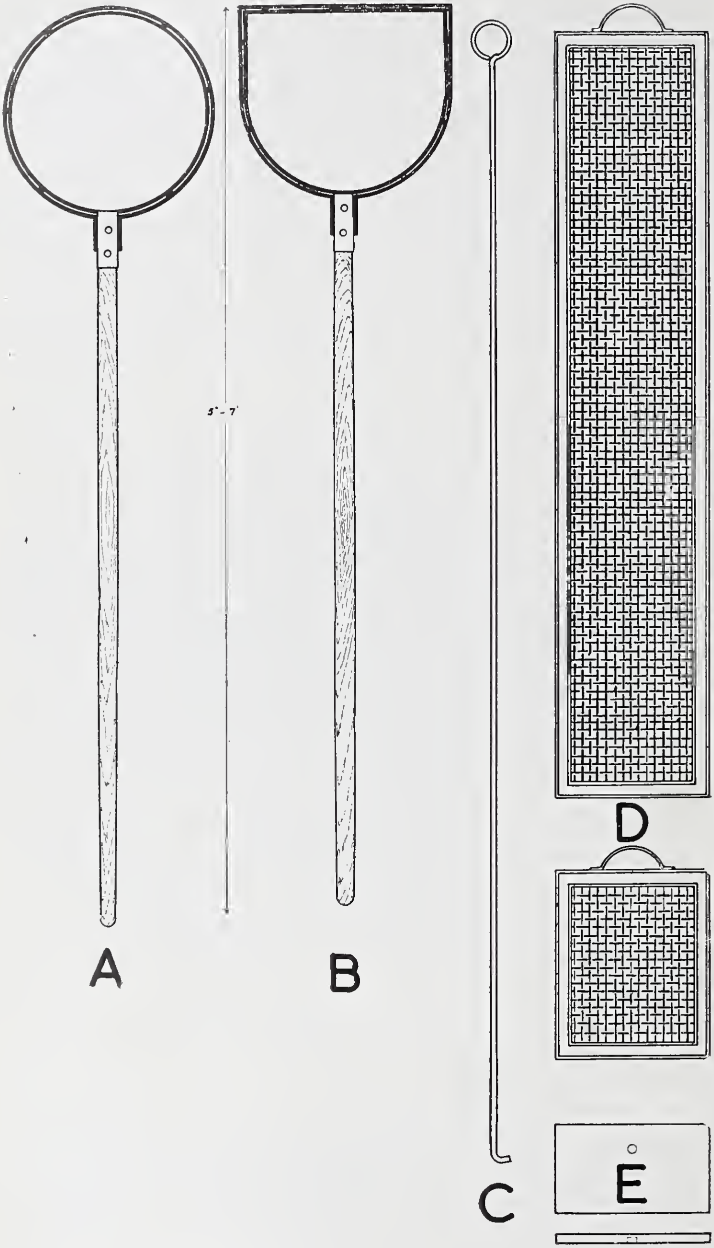
Drums.—Halved 44-gallon drums fitted with handles as shown in Fig. 10 C. are very useful for transporting or weighing fish on a fish-farm. The use of carrying poles, as depicted in the lower sketch (Fig. 11, D.) considerably simplifies handling of the drums. To prevent fish from jumping out of the drums, a round piece of netting with an elastic band around the edge can be slipped over the top when the fish are being carried from one place to another.

Screens.—When a dam is being emptied, the floating plank is removed from its groove and a screen pushed into its place to prevent the fish from escaping while the water is being let out. These screens (Fig. 9, D) can easily be made with a framework of metal droppers or angle iron and a $\frac{1}{4}$-in. square wire mesh or a perforated zinc sheet with quarter inch holes. On account of its smoother surface, perforated iron is better to use because it can be cleaned more easily than wire mesh. Screens at the inlet of a dam prevent undesirable fish from entering the dam or the fish in the dam from escaping upstream.

NATURAL FOODS OF FISH.

Small floating or swimming live organisms play an important role in the diet of fish, especially in the younger stages of the fish's life. These small forms of life are collectively known as PLANKTON. The small animals in the plankton are called zooplankton and the algae phytoplankton. Other small organisms living on or in the bottom are called BENTHOS, which also forms an important food for some species of fish.

Just as on land, all living plants and animals in the water are dependant on the presence of certain minerals like phosphates, nitrates, etc. Bacteria break down organic matter into a form in which it can be used for the growth of algae, other water plants and some unicellular animals (Protozoa). The algae and protozoa are eaten by wheel animalicules (Rotifera), water fleas and insect larvae or tadpoles. The latter


5'- 7'
A
B
C
D
E

again are food for fish. Some fish, like the *Tilapias*, can live directly on algae and even mud and "soft" aquatic plants. The predatory fish, e.g. black bass, live on smaller fish.

This whole cycle is called a food-chain. of which the bacteria are the first link and the black bass the last. In Fig. 11 this food-chain is shown schematically.

Very clear water is usually poor in these forms of life. Muddy water does not allow the sun to penetrate well enough for the development of plankton and soft water-plants and would, therefore, also be unsuitable for fish-culture.

FERTILIZATION OF PONDS.

The natural productivity of dams in the Transvaal vary from 100 to 250 pounds of fish per acre per year. The fertility of fish-dams can be improved and maintained by the addition of fertilizers. According to our own experiments with *Tilapia* ponds and the literature on carp ponds, the productivity of a pond can be doubled through the use of fertilizers. This fertilization stimulates the increase of the organisms forming the food chain as depicted in Fig. 11 and described above.

To date we have had the most satisfactory results from fertilization with 800 lb. of agricultural lime and 165 lb. of superphosphate (19%) or 200 lb. of basic slag (17%) per acre per year. On account of the large variation in the natural productivity of different dams, it is difficult to lay down a formula for fertilizing as it would vary from one dam to another.

In broad outline the function of the lime is the following: It serves as a direct fertilizer where calcium (Ca) is used by plants and animals. Lime creates favourable conditions for the utilization of other fertilizers in the following way: it binds superfluous carbon-dioxide (CO_2) and neutralizes acids in the water through the formation of calcium bicarbonate which keeps the water slightly alkaline and serves as a buffer against too large a fluctuation in the pH. Acids in the mud are also neutralized, promoting the decomposition of organic material and the formation of a fine mud, which is important to the fertility of the water.

If at all possible, ponds should be drained and allowed to dry during winter. The lime is then strewn over the dry bottom in early spring. (Fig. 12.) The functioning of the lime can be improved by ploughing it shallowly into the ground with a rotary hoe or cultivator (Figs. 13 and

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← FIG. 9.

A and B—Two types of scoop nets.

C—Hook made out of half-inch reinforcing iron, used to pull up sluice-planks and screens from monk.

D—Screens of square mesh or perforated iron in iron frames.

E—Sluice-planks one inch thick with a hole halfway through on the one side, to enable planks to be hooked out of monk.

Sluice-planks and screens should be slightly narrower than the width of the monk between the deepest points of the grooves.

A en B—Twee tipes skepnette.

C—Hak van half-duim staal om toringplanke en siwwe uit toring op te trek.

D—Siwwe van vierkantige sifdraad of gaatjiessink in yster rame.

E—Toringplanke van een duim plank gemaak met 'n gaatjie aan die eenkant halfpad deurgeboor, sodat planke uit die toring gehak kan word.

Toringplanke en siwwe moet iets smaller wees as die breedte van die toring tussen die diepste punte van die groewe.

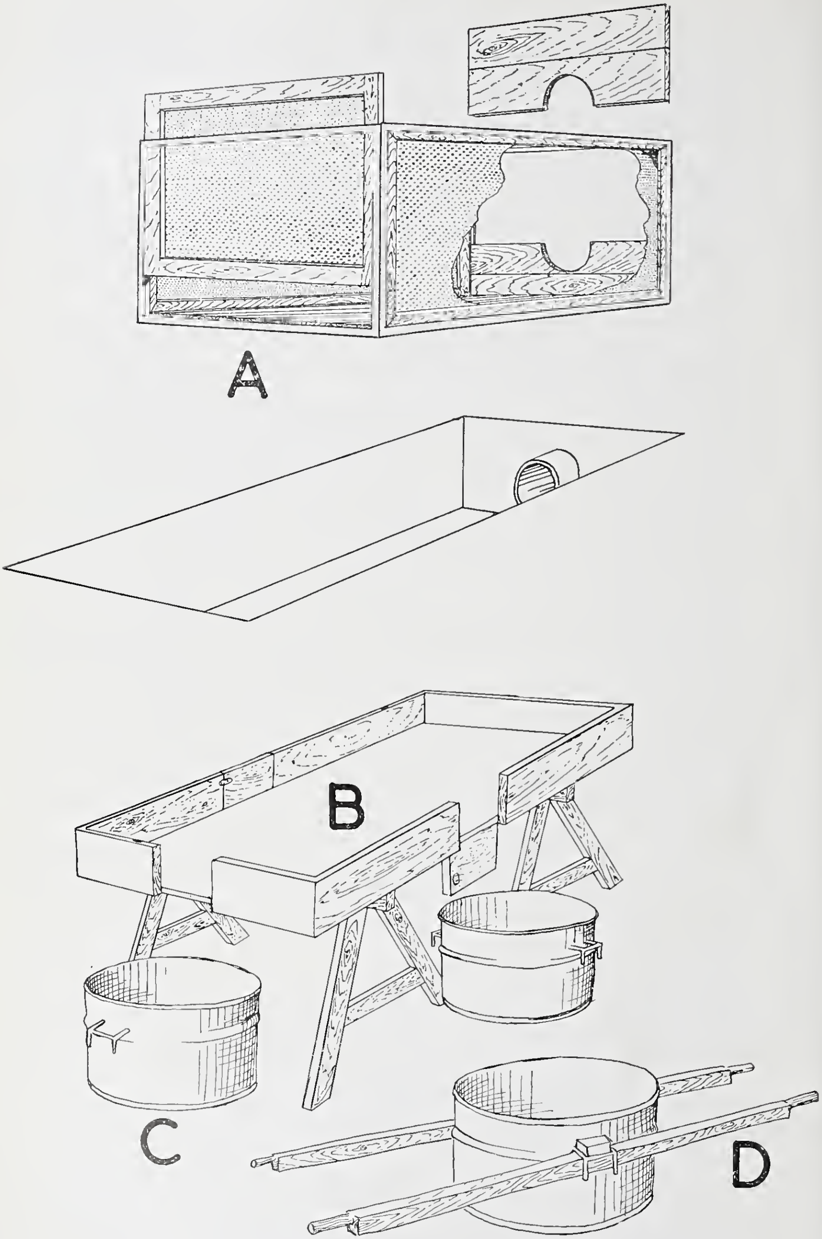

Fig. 10.

A—Sifkas; B—Sorteertafel; C—Dromme met handvatsels; D—Draagstokke.
A—Screening Box; B—Sorting table; C—Drums with handles; D—Carrying-poles.

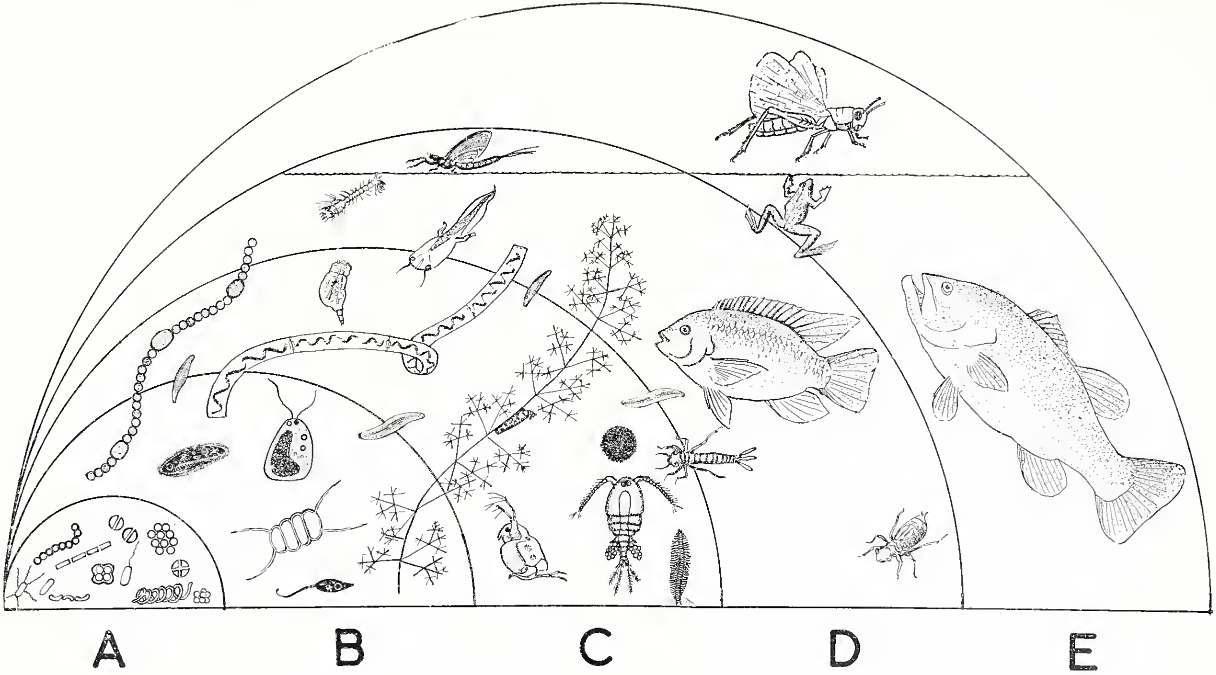

FIG. 11.

Scheme of Food Chain: A—Bacteria; B—Algae, one-celled animals (*Protozoa*) and "soft" waterplants; C—Rotifers, waterfleas and worms; D—Insect-larvae, primary fish and tadpoles; E—Secondary or climax fish.

Skema van Voedselketting: A—Bakterieë; B—Alge, eensellige diertjies (*Protozoa*) en "sagte" waterplante; C—Wieldiertjies (*Rotifera*), watervlooie en wurmpies; D—Inseklarwes, primêre vis en padda-vissies; E—Sekondêre of klimaks vis.

Let daarop dat die rame van die nette dubbel is om te verhoed dat die nette deurskuur. Rame met 'n deursnit van ongeveer 18 dm. en stele van 54 dm. is die handigste grootte. Die ronde net word gebruik om vis uit 'n treknet of drom te skep en die net met die reguit kant om vis uit die sifkas in die vangbak of uit verkoopstenks te skep.

Die sifkas.—Hierdie vierkantige kas (fig. 10, A) van hoekyster en hout, het 'n hout vloer en kante van gaatjiessink met ongeveer $\frac{1}{12}$ dm. openinge. Voor en agter moet daar groewe wees waarin die planke, wat om die inlaatpyp pas, en die agterste skuifdeur in en uit kan skuiwe. Die buitemaat moet effens smaller wees as die vangbak, sodat die kas maklik in die bak gesit kan word, en die kas moet minstens 'n voet korter wees as die vangbak sodat dit maklik onder die inlaatpyp in en uit kan beweeg. Nadat die sifkas in die vangbak geplaas is, moet twee blokke aan die ver kant tussen die bak en die kas ingeslaan word om hom voor teenaan die inlaatkant vas te druk, sodat hy tydens die leegmaak van die dam nie wegskuif nie. As die sifkas in posisie geplaas is, moet sy bokant minstens een voet bokant die vangbak uitstaan sodat die vis nie tydens die oes kan uitspring nie.

Sorteertafel.—Die sorteertafel het 'n blad van asbes-sement of plexiglas met 'n 9 dm. hoë hout rand rondom met openinge aan drie kante. Dit is belangrik dat die blad van die tafel 'n baie gladde oppervlak moet hê om besering van die vis wat op die tafel sorteer word te beperk. As die tafel op los blokke staan, soos in fig. 10, B, is dit makliker verskuifbaar dan wanneer dit van vaste pote voorsien is.

Die openinge aan die rand van die tafel moet van klappies of skuifdeurtjies voorsien word, sodat hulle oop- of toegemaak kan word.

Dromme.—Deurgesnyde 44-gelling dromme van handvatsels voorsien soos in fig. 10, C, is baie handig om die vis in te dra en te weeg. Die gebruik van draagstokke soos in die onderste skets fig. 10, D aangetoon, vergemaklik die hantering van die dromme aansienlik. Om te verhoed dat die vis uit die dromme spring, kan 'n ronde stuk net met 'n gomlastiek band buite om, bo-oor die dromme getrek word as hulle van die een dam na die ander gedra moet word.

Siwwe.—Wanneer 'n dam leeggemaak word, word die dryfplank uit die toring verwyder en 'n sif in die groef geskuiwe om die vis binne in die dam te hou terwyl die water sak. Hierdie siwwe (fig. 9, D) kan maklik uit 'n raamwerk van yster sparre („droppers") of hoekyster en 'n $\frac{1}{4}$ dm. vierkantige maas draad of gaatjiessink met kwartduim gate gemaak word. Laasgenoemde is beter om te gebruik omdat dit deur sy gladde oppervlak makliker is om skoon te maak as 'n draadsif. Siwwe by die inlaat van 'n dam verhoed dat ongewenste vis inkom of dat die vis wat in die dam is, ontsnap deur stroom-op te swem.

NATUURLIKE VOEDSEL VAN VIS.

Klein drywende of swemmende lewende organismes speel 'n belangrike rol in die voeding van vis, veral in die jong stadia. Hierdie klein vorms van lewe word gesamentlik PLANKTON genoem. Die klein diertjies hierin staan bekend as zooplankton en die alge as phytoplankton. Ander klein organismes wat op of in die modderbodem lewe, staan bekend as BENTHOS, wat ook 'n belangrike voedsel vir sommige vissoorte is.

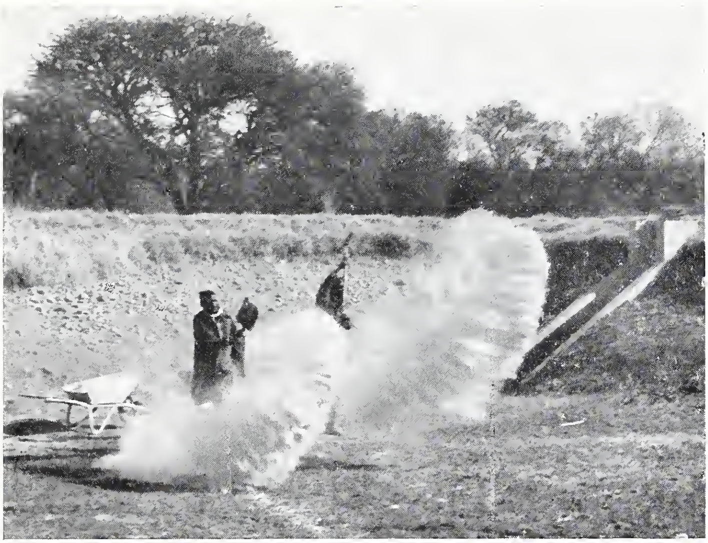

FIG. 12.
Fertilizer being strewn over a dry dam floor.
Kunsmis word oor 'n droë dambodem gestrooi.

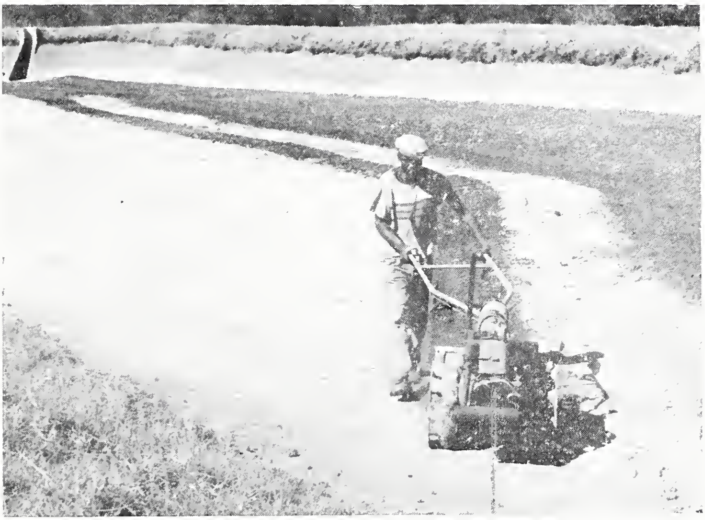

FIG. 13.
Ploughing in the fertilizer with a " Rotary Hoe ".
Kunsmis word met 'n " Rotary Hoe " ingeploeg.

Net soos op land is alle lewende plante en diere in die water afhanklik van die aanwesigheid van sekere soute soos fosfate, nitrate, ensovoorts. Bakterieë breek organiese materiaal af tot 'n vorm waarin dit bruikbaar is vir die groei van alge, ander waterplante en sommige eensellige diertjies (Protozoa). Die alge en eensellige diertjies word deur wieldiertjies, watervlooie en inseklarwes of paddavissies gevreet. Hierdie verskeidenheid organismes is op hulle beurt weer voedsel vir visse. Sommige visse, soos die kurper byvoorbeeld, kan direk op alge en selfs op modder en sagte waterplante lewe. Die sogenaamde roofvisse, soos swartbaars byvoorbeeld, leef weer op ander vis.

Hierdie hele kringloop word 'n voedselketting genoem, waarvan die bakterieë die eerste en die roofvis die laaste skakel is. In fig. 11 word hierdie voedselketting skematies voorgestel.

Baie helder water is meestal arm aan hierdie lewensvorme. Water wat modderig is, laat die son nie diep genoeg deurdring vir die ontwikkeling van plankton en sagte waterplante nie en sal ook vir visteelt ongunstig wees.

BEMESTING VAN DAMME.

Die natuurlike produksie van damme in Transvaal varieer van 100 tot 250 pond vis per akker per jaar. Die vrugbaarheid van damme kan verbeter en in stand gehou word deur die toediening van bemestingstowwe. Volgens ons eksperimente met kurperdamme en die literatuur oor karpdamme, kan die produksievermoë deur bemesting verdubbel word. Hierdie bemesting bevorder die sogenaamde voedselketting soos hierbo beskrywe en uitgebeeld in fig. 11.

Tot dusver het ons goeie resultate gehad deur met 800 pond landboukalk en 165 pond superfosfaat (19%) of 200 pond basiese slakmeel (17%) per akker per jaar te bemes. Deurdat damme so geweldig van mekaar in natuurlike vrugbaarheid verskil, is dit egter moeilik om 'n vasgestelde bemestingskwota neer te lê en sal dit van dam tot dam wissel.

Die funksie van die kalk is in breë trekke die volgende: Dit dien as direkte bemesting waar kalsium (Ca) deur plante en diere benut word. Verder skep dit gunstige toestande vir die benutting van die ander bemestingstowwe, en wel as volg: Dit bind oortollige koolsuurgas (CO_2) en neutraliseer sure in die water deur kalsium bikarbonaat te vorm wat die water swak alkalies hou en as 'n buffer dien wat groot skommelings in pH verhoed. Ook in die modder neutraliseer die kalk sure en bevorder die ontbinding van organiese materiaal en die vorming van 'n fyn modder wat vir die vrugbaarheid van die water belangrik is.

Waar moontlik moet die damme in die winter drooggelê word, want die beste resultate word verkry deur kalk oor die droë bodem van die dam te strooi (fig. 12). Die uitwerking van die kalk kan verder verhoog word deur dit met 'n „ Rotary Hoe " vlak in te ploeg (fig. 13 en 14), of met vurke vlak in te werk. Die tekstuur van die dambodem word hierdeur behou en die vorming van 'n digte sliklaag word teëgewerk. Let weer op die bodemkanaaltjie wat op die vloer van die dam aangebring is sodat mens, as jy vis oes, vars water na die toring en vangbak kan deurlaat om te verhoed dat die vis verstik.

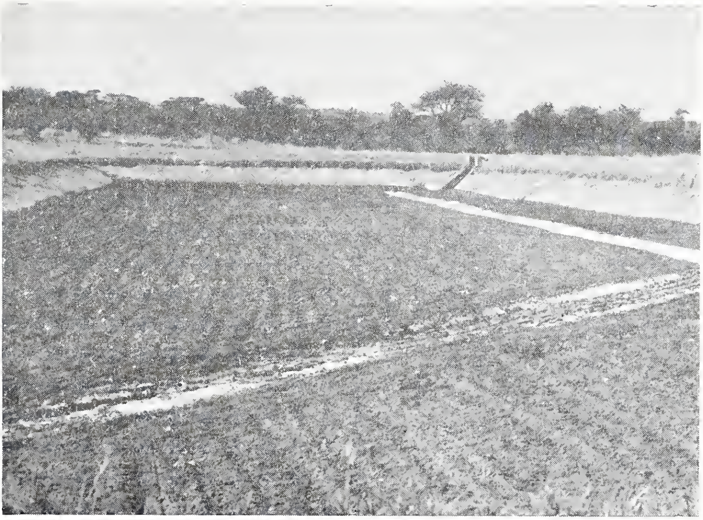

FIG. 14.

Fertilized, ploughed dam with bottom-canal running from the inlet to the monk.
Bemeste, klaargeploegde dam met bodemkanaal vanaf die inlaat tot by die uitlaat toring.

14) or by working it into the soil with garden forks. By doing this the texture of the bottom is preserved and the formation of a compact silt layer is prevented. Note again, the bottom canal which allows fresh water to be brought directly to the monk and trap to prevent suffocation of the fish when harvesting is in progress.

In Spring the pond is filled with water and a fortnight later the superphosphate or basic slag should be strewn evenly over the water-surface. For optimal functioning the phosphates need a good mud bottom; the mud retains part of the fertilizer and releases it to the water gradually. Because basic slag acts slowly and also contains trace elements, some farmers prefer it to the other phosphates.

Workers in Central Africa are of the opinion that sulphates should also be used on account of the general sulphur deficiency in their soils. Intensive research in Europe has shown that lime and phosphate are the essential fertilizers and that the addition of other inorganic fertilizers like nitrogen and potassium does not result in a profitable increase in fertility. Organic fertilizing with fowl-manure, pig-manure, kraal-manure or compost can be recommended, especially for new dams. For good results with organic fertilizers, 2 to 7 tons of manure or compost per acre per year can be used together with phosphate.

The disadvantage of organic fertilization is, that it may lead to oxygen deficiency in the water. The activity of plant and animal fertilizers is also of shorter duration than that of inorganic substances and the former should, therefore, not be applied in bulk like the latter, but

In die voorjaar word die dam dan met water gevul en twee weke daarna moet die superfosfaat of slakmeel eweredig oor die wateroppervlakte gestrooi word. Vir optimale benutting het die fosfate 'n goeie modderlaag nodig; die modder hou 'n deel van die bemestingsstof vas en gee dit stadig af aan die water. Omdat slakmeel op hierdie manier oor 'n langer periode inwerk en ook heelwat spoorelemente bevat, word dit deur sommige mense bo die ander fosfate verkies.

Werkers in Sentraal-Afrika meen dat sulfate ook gebruik moet word weens die algemene swaweltekort in die grond aldaar. Intensiewe navorsing in Europa het aan die lig gebring dat kalk en fosfaat die beste anorganiese misstof is om die vrugbaarheid van die water te verhoog. Ander misstowwe soos stikstof en kalium het geen merkbare uitwerking nie en dit is nie nodig om dit toe te dien nie.

Organiese bemesting met hoendermis, varkmis, kraalmis of kompos kan veral vir nuwe damme aanbeveel word. Vir goeie resultate met organiese bemesting kan 2 tot 7 ton mis of kompos per akker per jaar saam met fosfate toegedien word.

Die nadele van organiese misstowwe is egter dat die ontbinding van die organiese materiaal, maklik kan lei tot suurstoftekort in die water. Die uitwerking van plantaardige en dierlike misstowwe is ook veel korter as dié van kunsmisstowwe en dit is dus beter om eersgenoemde nie in een klomp toe te dien soos kunsmis nie, maar om die toediening oor die hele somer te versprei. Sommige boere kombineer hulle visboerdery om hierdie rede met gans- en eendeboerdery—hierdie voëls doen geen skade aan klein vissies nie en hulle mis dien as bemesting van die water.

In Duitsland en in die Ooste word behandelde rioolafval soms vir bemesting van damme gebruik, maar daar dit 'n hele studieveld op sy eie is, word belangstellendes liewer na die betrokke literatuur verwys: (Demoll, 1926 en Mortimer, 1954).

Voorstrekdamme lewer baie goeie resultate na groenbemesting. 'n Vinniggroeiende gewas moet nie te dig op mekaar geplant word nie en omtrent 'n week voordat die dam met vis bevolk word, moet die water, sonder om die plante in te ploeg, ingelaat word. As mens 'n groente soos byvoorbeeld boontjies of blomkool in die winter in die voorstrekdam plant, kan die groente geoes en die stronke of stoele in die dam gelaat word as groenbemesting.

As gevolg van die geweldige ontwikkeling van eensellige alge na bemesting, kry die water 'n groen of groenbruin kleur, wat gewoonlik later ligter word deurdat van die alge in die voedselketting verbruik word.

Dit is 'n goeie beginsel om visdamme as beskerming teen parasiete of vissiektes van tyd tot tyd te ontsmet. Vir hierdie doel bemes mens dan met ongebluste kalk („quick lime") in plaas van met landboukalk. Dit is belangrik dat mens net met 400 lb. ongebluste kalk per akker bemes en nie 800 lb. soos in die geval van landbou-kalk nie. Ongebluste kalk is baie skerp en daar moet versigtig mee gewerk word.

Kunsmatige voeding sal later bespreek word.

WATERPLANTE.

Waterplante is ongewens in 'n dam wat vir visboerdery gebruik word. Hierdie plante verbruik nie alleen die bemesting nie, maar kan, in die geval van onderwaterplante snags lei tot suurstoftekort. Saam met oewer

the application should be spread over the whole summer. For this reason some farmers combine their fish farming with that of ducks and geese — these birds do no harm to small fish and their excreta serve as a natural fertilizer in the water.

In Germany and the Orient, treated sewage effluents are sometimes used for fertilizing dams. This is, however, a study field of its own, and those interested should rather refer to the specific textbooks in the list of literature. (Demoll, 1926 and Mortimer, 1954.)

Nursery ponds give very good results with green manuring. A fast growing plant should be sown sparsely and about a week before the fish are stocked, the dam should be filled with water without having ploughed in the plants. If vegetables such as beans or cauliflower are planted in the nursery pond in winter, the crop can be gathered and the stalks or plants left in the pond as a fertilizer.

As a result of the intense development of unicellular algae after fertilization, the water turns green or greenish-brown in colour, which afterwards usually becomes less intense on account of the algae being used in the food chain. The pond is now ready to be stocked with fish.

It is a good principle to disinfect fish dams from time to time as a protection against parasites or diseases. For this purpose quick-lime should be used instead of agricultural lime. It is important that only 400 lb. of quick-lime be used per acre instead of 800 lb. as in the case of agricultural lime. Quick-lime is corrosive and care should be exercised in its use.

Artificial feeding will be discussed later.

AQUATIC PLANTS.

Aquatic plants are undesirable in dams which are to be used for fish-farming. Not only do these plants consume the fertilizer, but they can, in cases of submerged plants, give rise to oxygen deficiency at night. Together with the littoral vegetation like reeds and bullrushes these plants can be a nuisance whilst netting. Floating water plants like the water hyacinth and the leaves of water lilies prevent penetration of the sun and are therefore detrimental to the development of plankton.

In Natal, however, a submerged aquatic plant, *Vallisneria*, is specially cultivated in the fish ponds, where it is eaten by both *Tilapia melanopleura* and *Tilapia mossambica*. (Personal communication, 1959.)

TILAPIA FARMING.

Of the five indigenous species of kurper in the Transvaal only three are suitable for fish-farming.

(1) *Tilapia mossambica*.—The *Tilapias* are popularly known as kurper or freshwater bream. *Tilapia mossambica* is called the blue kurper, red-finned kurper, Mocambique kurper or three-spotted kurper. Anglers sometimes refer to the males as the large-mouth kurper and to the females as small-mouth kurper, and in the winter months or when taken from turbid water this fish is so light in colour that it is also known as the white kurper. *Tilapia mossambica* can always be distinguished from the other indigenous species by the relatively large number of gill-rakers on the lower half of the first gill-arch. In this species the number of rakers vary from 13 to 20 as compared with the 7 to 12 in our other indigenous species.

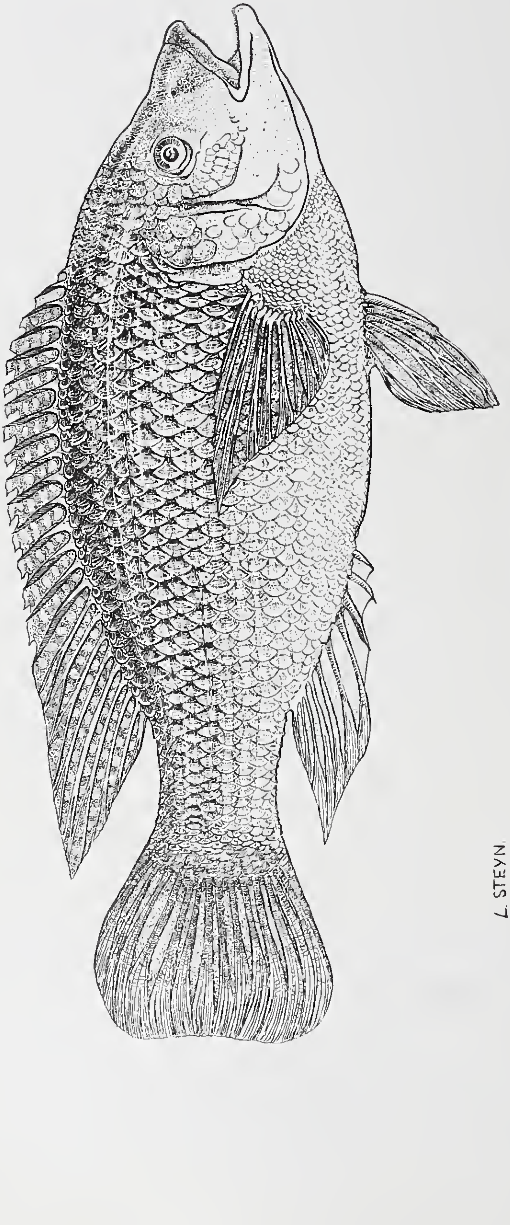

FIG. 15.
Tilapia mossambica.

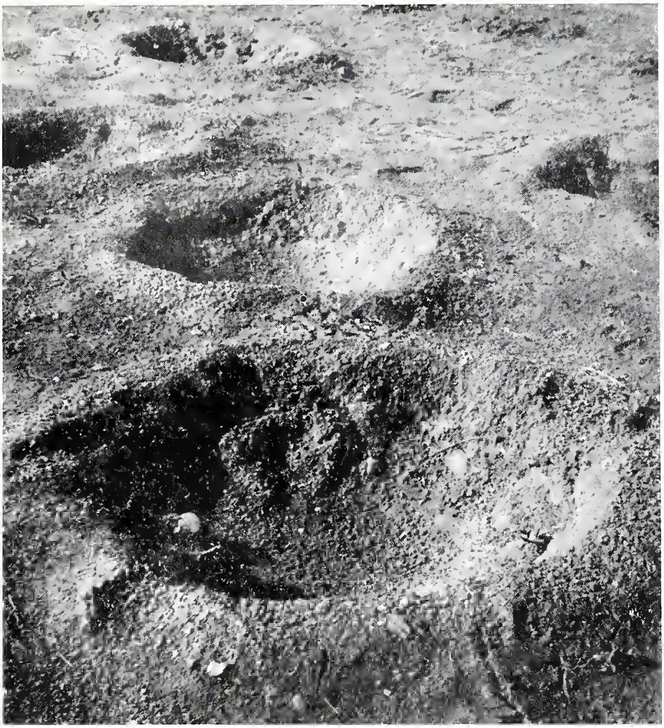

FIG. 16.

Remains of *Tilapia mossambica* nests in a dry dam.

Oorblyfsels van *Tilopia mossambica* neste in 'n droë dam.

The blue kurper is the largest of our indigenous species, the present Transvaal record being 5 lb. 9 ozs. Of the indigenous *Tilapias, T. mossambica* is the fastest grower; in a fertile pond with a normal stocking rate it takes this fish three years to attain the weight of one pound. Its excellent flavour makes it the most popular table fish of our inland waters and it is also the kurper on which the most research has been done to date. *T. mossambica* is already being farmed in Indonesia, Malaya, Thailand, Ceylon, Hawaii, Isreal and Egypt and has been distributed to Japan and South Korea.

In Spring, as soon as the water starts to warm up the kurper spawns on the incline of the dam wall or on the bottom between depths of 1 to 4 ft., the males build a nest consisting of a saucer-shaped hollow with an average diameter of 1 ft.

The males are particular and will not mate with just any female. Should the male have found a suitable female, he ushers her to the nest, displays in front of her and nuzzles her in her flanks until she starts to lay eggs. He then swims over the eggs and fertilizes them. The female

plante soos riet, biesies en palmiet, kan hulle ook baie lastig wees as nette getrek moet word. Drywende waterplante soos die waterhiasint en waterlelies keer indringing van sonstrale in die water en benadeel dus die groei van plankton.

In Natal, egter, word 'n onderwater plant, *Vallisneria*, spesiaal in visdamme geplant waar dit as voedsel dien vir beide *Tilapia melanopleura* en *T. Mossambica*. (Persoonlike kommunikasie, 1959.)

KURPERBOERDERY.

In Transvaal kom daar vyf inheemse kurpersoorte voor waarvan slegs drie vir visboere van belang is.

(1) *Tilapia mossambica*.—Hierdie kurpersoort staan bekend as die bloukurper, rooivinkurper, Mossambiekkurper of driekolkurper. Hengelaars praat soms van die mannetjies as grootbekkurper en die wyfies as kleinbekkurper en in die wintermaande of in troebel water is hy soms so lig van kleur dat hy ook witkurper genoem word. *Tilapia mossambica* kan altyd van die ander inheemse soorte deur die groot aantal kieusiftande op die onderste helfte van die eerste kiefboog onder die kiefdeksel onderskei word. Die aantal varieer tussen 14 en 20 teenoor die 7 tot 12 by ons ander kurpersoorte.

Die bloukurper is die grootste van ons inheemse soorte; die huidige Transvaalse rekordgrootte is 5 lb. 9 ons. Van die inheemse soorte groei hy ook die vinnigste; in 'n vrugbare dam met normale besetting neem dit gewoonlik drie jaar vir die vis om een pond gewig te bereik. Sy uitstekende smaak maak hom dan ook die gewildste tafelvis van ons binnelandse waters en hy is ook die kurper waarop die meeste navorsing tot dusver gedoen is. *T. mossambica* word reeds as boerderyproduk in Indonesië, die Maleise Skiereiland, Thailand, Ceylon, Hawaii, Israel en Egipte gebruik en is selfs al tot in Japan en Suid Korea versprei.

In die voorjaar, sodra die water begin warm word, begin die kurper broei. Die mannetjies maak 'n nes wat bestaan uit 'n pieringvormige holte van gemiddeld 1 vt. deursnee, teen die skuinste van die damwal of op die dambodem tussen dieptes van 1 tot 4 vt.

Die mannetjies is kieskeurig en sal nie met enige wyfie paar nie. As die mannetjie 'n geskikte wyfie vind, bring hy haar na die nes toe, pronk voor haar en por haar met sy neus in haar sye totdat sy begin eiers lê. Hy swem dan bo-oor die eiers en bevrug hulle. Die wyfie tel die bevrugte eiertjies in haar bek op en die proses word herhaal totdat sy, na gelang van haar ouderdom, van 50 tot oor 1,000 eiers gelê het. Die eiers broei binne drie dae uit in die wyfie se bek en die kleintjies word deur haar rondgedra totdat hulle kan begin vreet. Hulle verlaat dan die moeder se bek, maar sodra gevaar dreig swem hulle dadelik terug. Na gelang van die hoeveelheid beskikbare voedsel word hulle dan tot op 'n ouderdom van twee of drie weke so deur die wyfie versorg, waarna hulle aan hulself oorgelaat word.

Totdat die vissies 2 dm. lank is, verkies hulle zooplankton as voedsel. Van 2 tot 3 dm. eet hulle alle plankton en daarna hoofsaaklik alge en growwer plantemateriaal. As kunsvoeding het ons meule-afval en lusernmeel toegedien, maar aangesien dit lyk of hierdie voedsel nie goed verteer nie, sal ons visboere voorlopig aanraai om alleen op bemesting te konsentreer, ook aangesien dit finansieel veel meer lonend is.

takes the fertilized eggs into her mouth and the process is repeated until she has laid from 50 to 1,000 eggs, depending on her age. Within three days the eggs hatch and the young are carried in the mother's mouth until they start to feed. They leave her mouth for this purpose, but at the first sign of danger, immediately return to the safety of the mother's mouth. Depending upon the amount of food present, they are cared for in this way for two to three weeks when they are left to fend for themselves.

Up to a length of 2 in., the small fish prefer to eat zooplankton. Between 2 and 3 in. they eat all plankton and thereafter mainly algae and higher plant material. As an artificial food we have tried mill-sweepings and lucerne-meal, but as it appears that this food is not properly digested by the fish, farmers are advised in the mean time to concentrate only on fertilizing which is more economical.

Tilapia mossambica occurs naturally in the Transvaal in the Bushveld and Lowveld in all rivers that flow into the Indian Ocean. This fish is, therefore, not resistant to the colder waters of the Highveld and is not suited for areas where the water temperature falls below 10° C. (50° F.). In Lowveld areas where frost occurs dams must be deeper than 6 ft. at the monk, because deeper water is not subject to such large fluctuations in temperature and will not become as cold as shallow dams would overnight. In such areas these fish should not be netted or handled between April and September, because disturbance of the protective slime layer during the winter months makes the fish susceptible to attack by fungi which can be lethal. In cold areas it is also necessary to construct special marketing tanks as shown in Fig. 23. This minimizes handling of the fish in the large marketing ponds during winter. If a large deep pond is available the fish can be transferred to it for the winter. This gives the production ponds a chance to dry completely and to be fertilized and cultivated properly.

Although most consumers prefer a kurper of between $\frac{3}{4}$ to $1\frac{1}{2}$ lb., the fish is marketable from $\frac{1}{2}$ lb. upwards. According to our experience the Bantu consumers prefer $\frac{1}{2}$ lb. fish to larger ones.

On account of the males growing faster than the females, the idea arose to have monosex cultures. This prevents the fish from breeding and losing weight. It is not, however, possible to sex the small fish with 100% accuracy and a few females in a pond are sufficient to let the males build nests during which period they do not feed and lose weight. In the second and third years sexing can be more accurately done, making monosex farming more practicable. At the present stage it is, however, not clear whether the labour involved in sexing would be profitable.

Those who are interested, can obtain further particulars from the research station at Marble Hall.

To get the red-finned kurper to a marketable size ($\frac{3}{4}$ lb.—1 lb.) our experiments to date indicate the following stocking rates in fertilized ponds:—

1st. year: Rearing ponds I = 2,800 fish per $\frac{1}{2}$ acre.
2nd. year: Rearing ponds II = 1,400 fish per $\frac{1}{2}$ acre.
3rd. year: Production ponds = 700 fish per $\frac{1}{2}$ acre.

A small number of black bass should always be stocked together with *Tilapia* to prevent overstocking. For details refer to the chapter concerning this fish.

Tilapia mossambica kom in Transvaal natuurlik voor in die bosveld en laeveld in alle riviere wat in die Indiese Oseaan vloei. Hy is dus glad nie bestand teen die koue waters van die hoëveld nie en is glad nie geskik vir dele waar die watertemperature laer as 10° C. (50° F.) daal nie. In gebiede waar daar wel ryp voorkom, moet die damme by die uitlaat dieper as 6 vt. wees, omdat dieper water nie aan sulke groot temperatuurskommelings onderhewig is nie en daarom nie oornag so koud sal word as 'n vlak dam nie. In sulke gebiede moet die vis ook nie genet of hanteer word na April of voor September nie, omdat versteuring van die beskermende slymlaag in die wintermaande die visse vatbaar maak vir swamme (Fungi), wat hulle dood kan veroorsaak. In sulke gebiede is dit dan ook noodsaaklik om spesiale verkoopstenks, soos op fig. 23 aangetoon, te bou sodat hantering van vis in die groter markdamme in die winter tot 'n minimum beperk word. As mens oor 'n groot diep dam beskik, kan die vis daarin oorgeplaas word om te oorwinter. Dit gee die produksiedamme dan ook kans om droog te lê en behoorlik bemes te word.

Hoewel die meeste verbruikers 'n kurper van tussen ¾ lb. tot 1½ lb. verkies, is hy reeds bruikbaar en bemarkbaar van ½ lb. Volgens ons ervaring verkies Bantoeverbruikers ½ lb. vis bo groteres.

Omdat die mannetjies vinniger groei as die wyfies, het die gedagte ontstaan om die geslagte te skei en aparte damme vir mannetjies en wyfies te hê. Dit verhoed ook dat die vis broei en daardeur gewig verloor. Dit is egter nie prakties moontlik om die geslag van die klein vis met 'n 100% akkuraatheid vas te stel nie en 'n paar wyfies in 'n dam is genoeg om die mannetjies te laat nes bou. Gedurende dié tydperk eet die mannetjies nie en word hulle groei vertraag.

In die tweede en derde jare is die geslagte egter makliker te onderskei en is monoseks boerdery meer uitvoerbaar. Op hierdie stadium is dit egter nog nie duidelik of die arbeid hieraan verbonde lonend is nie. Geïnteresseerde persone kan verdere inligting van die navorsingstasie by Marble Hall kry.

Om rooivinkurpers na hulle derde somer op 'n bemarkbare grootte (¾ lb. tot 1 lb.) te kry, dui ons eksperimente tot op datum op die volgende besettingsdigthede in bemeste damme:—

1ste jaar: Grootmaakdamme I = 2,800 vis per ½ akker.
2de jaar: Grootmaakdamme II = 1,400 vis per ½ akker.
3de jaar: Produksiedamme = 700 vis per ½ akker.

Saam met die kurpers moet mens altyd 'n paar swartbaars insit om te verhoed dat die damme oorbevolk raak. Verwys vir besonderhede in hierdie verband na die hoofstuk betreffende hierdie vissoort.

(2) *Tilapia melanopleura.*—In die volksmond word hierdie kurper (fig. 17) die rooiborskurper genoem, omdat veral die wyfies in die broeityd 'n helderrooi kleur op die bors ontwikkel. Hengelaars noem hierdie vis ook soms die stompneuskurper of kleinbekkurper. Sy duidelikste onderskeidingsmerk is sy ronder meer regaf voorkop en die feit dat die boonste helfte van die stertvin soms gespikkeld en altyd donkerder van kleur is as die onderste helfte. Die aantal kieusiftande varieër van 8-12.

Hoewel hierdie kurper nie so groot word as *Tilapia mossambica* nie, is hy ook baie geskik vir damme in die laeveld, waar hy deur sy plantaardige dieet baie nuttig is om die ongewenste waterplante te bestry. In laeveldse damme waarin daar baie sagte waterplante groei, kan hierdie vissoort byna net so vinnig groei as *T. mossambica.*

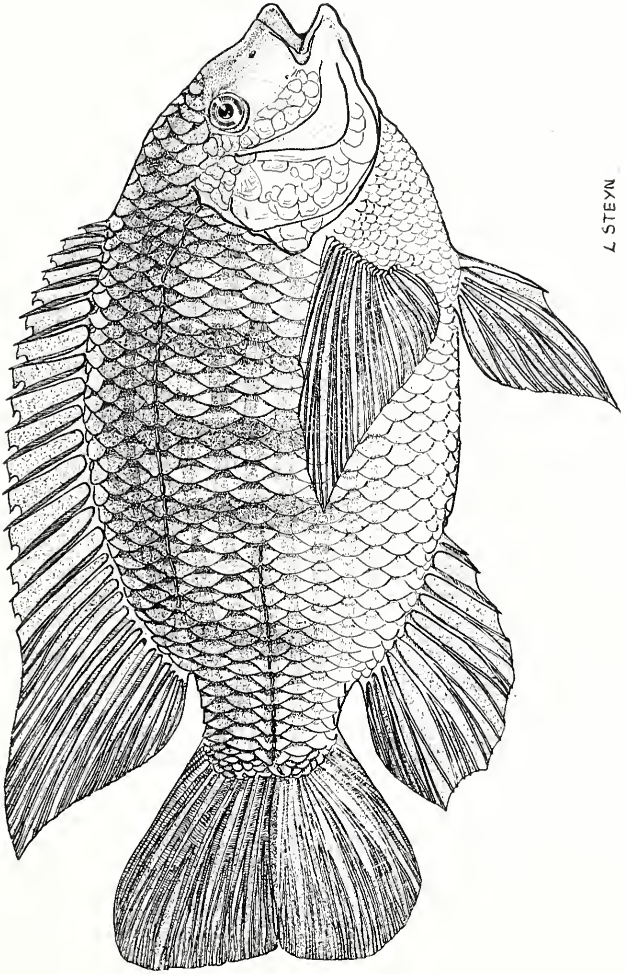

Fig. 17.
Tilapia melanopleura.

T. melanopleura is ook 'n uitstekende tafelvis en word op 'n groot skaal in dele van Sentraal-Afrika vir voedsel geproduseer. Die vis wat daar bekend staan as *Tilapia zilii* is waarskynlik net 'n variasie van dieselfde species.

Die broeigewoontes van *T. melanopleura* verskil van dié van *T. mossambica.* Die eiers is klewerig en word op 'n harde voorwerp soos 'n klip of in 'n vlak nes gelê. Beide ouers pas hulle op en neem beurte om met waai-bewegings van hulle vinne die water oor die eiers te laat beweeg, sodat daar voldoende suurstof sal wees vir die ontwikkeling van die embrios. Intussen word daar rondom die nes kleiner gaatjies gemaak, waarin die ouers die kleintjies plaas nadat hulle uitgebroei het. Beide ouers help dan om die kleintjies gereeld van die een gat na die ander te verskuif, totdat hulle na 'n paar dae self kan rondswem. Vir om en by twee weke pas die ouers dan die skool kleintjies op en los hulle dan om vir hulleself te sorg. Alhoewel die vissies van minder as 2 dm. ook zooplankton verkies, word hierdie dieet later deur plantmateriaal vervang.

Hierdie vis wat 'n tipiese laeveldse of tropiese soort is en baie gevoelig is vir koue, sal ook slegs geskik wees vir die laer, warmer dele van Transvaal. Hulle is deur ons as eksperiment in 'n hoëveldse dam geplaas om waterplante uit te roei en het hulle dan ook goed van hulle taak gekwyt, maar geeneen van die eksperimentele visse het die streng winter oorleef nie.

In Transvaal leen die rooiborskurper homself nie tot intensiewe visboerdery nie, maar waar waterplante voorkom, kan hy saam met die bloukurper gebruik word om die plante te beheer. Die getal wat nodig is, sal van die hoeveelheid waterplante in die dam afhang.

(3) *Tilapia sparrmannii.*—Hierdie vis (fig. 18) se boerenaam is vleikurper, Sparrmann se kurper of hoëveldse kurper en soos die laaste naam aandui, is hy die enigste kurpersoort wat vir die kouer dele van Transvaal geskik is.

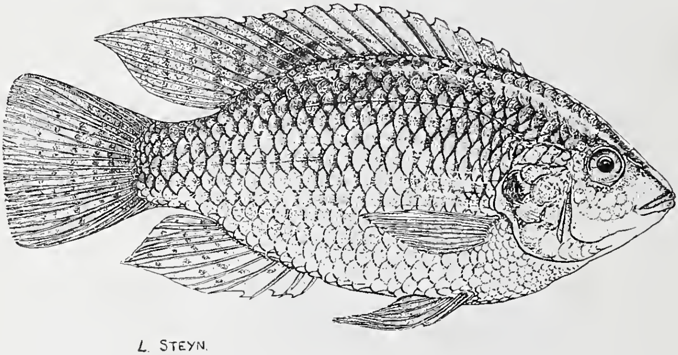

FIG. 18.
Tilapia sparrmannii.

In vorm stem die vleikurper baie ooreen met die rooiborskurper en verskil hoofsaaklik van laasgenoemde daarin dat die stertvin deurlopend een kleur het, en dat die rugvin by *T. sparrmannii* bestaan uit 13 tot 15 onvertakte en 9 tot 11 vertakte strale teenoor die 15 tot 16 onvertakte en

(2) *Tilapia melanopleura*.—In colloquial language this fish is known as the red-breasted kurper, because in the breeding season the females develop a bright red colour on the belly. Anglers sometimes refer to this species as the stumpnose or the small-mouth kurper. The most conspicuous distinguishing features are its round, more vertical forehand and the fact that the upper half of the tail fin is often speckled and always darker in colour than the lower half. The number of gill-rakers vary from 8 to 12.

Although this bream does not attain the same size as *Tilapia mossambica*, it is suitable for dams in the Lowveld, where it is advantageous in combating undesirable water plants on account of its vegetarian habits. In dams in warm areas where soft waterplants predominate, this *Tilapia* species can grow just as fast as *T. mossambica*. *T. melanopleura* is also an excellent table fish and is produced for food on a large scale in parts of Central Africa. The fish known there as *Tilapia zillii* is most probably a variety of the same species.

The breeding habits of *T. melanopleura* differ from those of *T. mossambica*. The eggs are adhesive and are laid on hard objects such as stones or in shallow nests. Both parents guard the eggs and take turns to circulate water over them by fanning movements of the fins, in order to ensure sufficient oxygen for the development of the embryos. In the meantime small pits, into which the parents place the small fish, after hatching, are excavated around the nest. Both parents assist in moving the fry regularly from one pit to another until they start swimming. The parents guard the shoal of small fish for about two weeks after which period they are left to fend for themselves. Although the young of less than 2 in. prefer zooplankton, this diet is later replaced by plant material.

This fish, which is a typical Lowveld or tropical species, is very sensitive to cold, and will be suitable only for the lower, warmer parts of the Transvaal. A large number of these fish were placed by us in a Highveld dam as an experiment to clear waterweeds. They acquitted themselves well of their task, but none of the experimental fish survived the severe winter.

In the Transvaal the red-breasted kurper does not lend itself to intensive culture, but where waterplants occur it can be combined with the blue kurper to control the plants. The number of fish necessary will depend on the amount of waterplants present.

(3) *Tilapia sparrmannii*.—This fish (Fig. 18) is called the vlei kurper, Sparrmann's kurper or the Highveld kurper and as the latter name implies, it is the only kurper suited to the colder parts of the Transvaal.

In general shape the vlei kurper resembles the redbreasted kurper and differs from the latter mainly in the fact that the tail is uniform in colour and that the dorsal fin of *T. sparrmannii* has 13 to 15 unbranched rays or spines and 9 to 12 soft branched rays as opposed to the 15 to 16 spines and 12 to 13 soft branched rays of *T. melanopleura*. *T. sparrmannii* usually has a beautiful blue-green lustre which is especially noticable on the gill cover.

Because this fish never grows to more than half a pound it is not well suited to fish-farming. Highveld farmers can, however, cultivate it in an ordinary farm dam and include it in the rations of their Bantu labourers, who are usually not so particular about the size of a fish.

At present this kurper is used mainly as a fodder fish for black bass in Highveld dams.

12 tot 13 vertakte vinstrale van *T. melanopleura*. *T. sparrmannii* het meestal 'n pragtige blou-groen kleurspeling wat veral op die kiefdeksel opvallend is.

Omdat hierdie kurper nie swaarder as 'n half-pond word nie, is dit nie vir visboerdery geskik nie. Hoëveldse boere kan dit egter in 'n gewone plaasdam kweek vir gebruik in die rantsoene van Bantoe-arbeiders, wie gewoonlik nie so gesteld is op die grootte van die vis nie.

Tans word die vleikurper hoofsaaklik as voervis vir grootbekswartbaars in hoëveldse plaasdamme gebruik.

GROOTBEKSWARTBAARS.

(*Micropterus salmoides*).—Die Amerikaanse grootbekswartbaars (fig. 19) is 'n baie lekker eetvis en sy vleis word met dié van die forel vergelyk. Hy is ook 'n vinnige groeier en kan onder normale omstandighede binne een jaar een pond swaar word; sy rekord grootte is 10 lb.

Hierdie roofvis wat hoofsaaklik van klein vissies lewe, word in die kurperboerdery gebruik om die voedsel, wat nie deur die kurper benut word nie, te vreet en om oorbevolking van produksiedamme te verhoed deur klein vissies wat daar uitbroei, op te vreet.

Die grootbekswartbaars verkies om sy klewerige eiers op die wortels van waterplante of op gruisagtige plekke te lê. Indien geskikte broeiplekke in 'n dam ontbreek, kan mens vir die swartbaars ronde plate gruis of klippies (tot 3 dm. deursnee) op verskillende plekke in die dam strooi. Hierdie broeiplatvorms moet omtrent 3 vt. in deursnee wees en op 'n diepte van tussen 2 en 3 vt. geplaas word. In die lente sal die mannetjie hierdie gruisplaat skoonmaak en nadat die wyfie haar eiers daarop gelê het, sal hy hulle bevrug en oppas. As die kleintjies uitbroei, swem hulle in 'n digte skool rond en word deur die mannetjie opgepas, totdat hulle omtrent 'n duim lank is.

Swartbaars moet in 'n verhouding van omtrent 10 baars tot 100 kurpers in die produksiedamme gesit word.

KARPBOERDERY.

Hierdie vis wat oorspronklik uit die Ooste kom, word al vir honderde jare op die vasteland van Europa geteel. Die besondere karp wat afgebeeld is in fig. 20 is 'n variëteit wat na 300 jaar se selektiewe teelt in Duitsland spesiaal vir visboerdery ontwikkel is. Die Transvaalse Provinsiale Administrasie het onlangs van hierdie vissoort ingevoer spesifiek vir visboerdery, en hoofsaaklik vir die kou hoëveld waar kurpers nie sal aard nie.

Boere wat met karp wil boer, sal spesiale siwwe in die afvoerkanale van hulle damme moet aanbring, om te verhoed dat hierdie vis in natuurlike waters versprei. As karp nie voortdurend geselekteer word nie, kan hulle maklik deur inteelt agteruitgaan en ontaard.

Die Aischgrundkarp wat pas ingevoer is, groei besonder vinnig en kan in een jaar in 'n produksiedam tot 3 lb. swaar word. Hierdie vis onderskei hom van ander karpsoorte deur sy opvallende hoë skof, baie vleis en besondere skubrangskikking.

Die broeigewoontes van die karp is heeltemal anders as die visse wat tot dusver bespreek is. Dit is daarom ook belangrik dat spesiale broeidammetjies by 'n karpboerdery aangelê word. Die beste grootte van 'n broeidam is omtrent 24 vt. by 30 vt., met 'n diepte wat varieer van

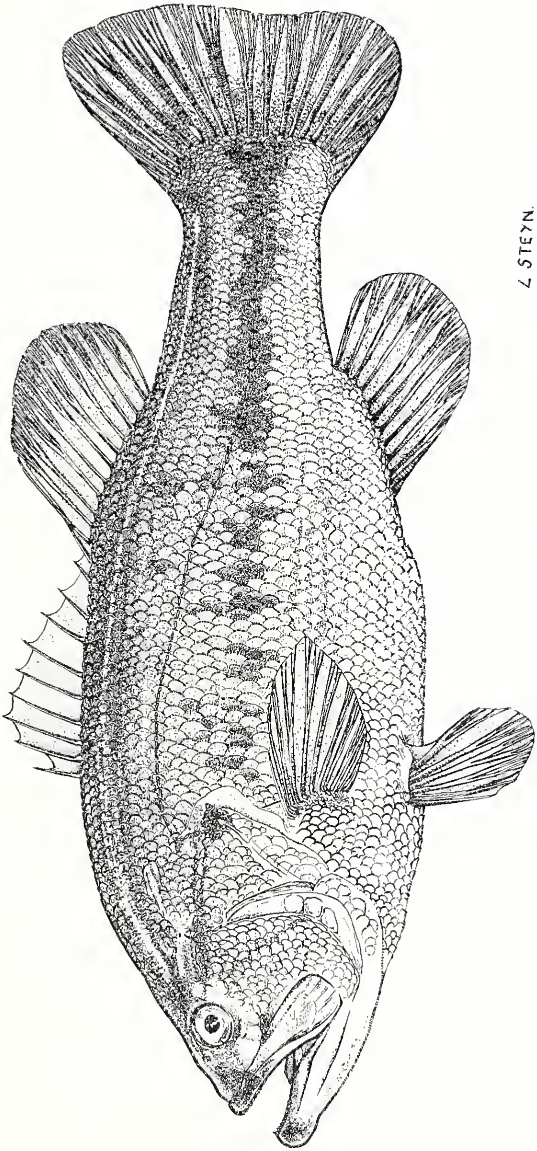

Fig. 19.
Micropterus salmoides.

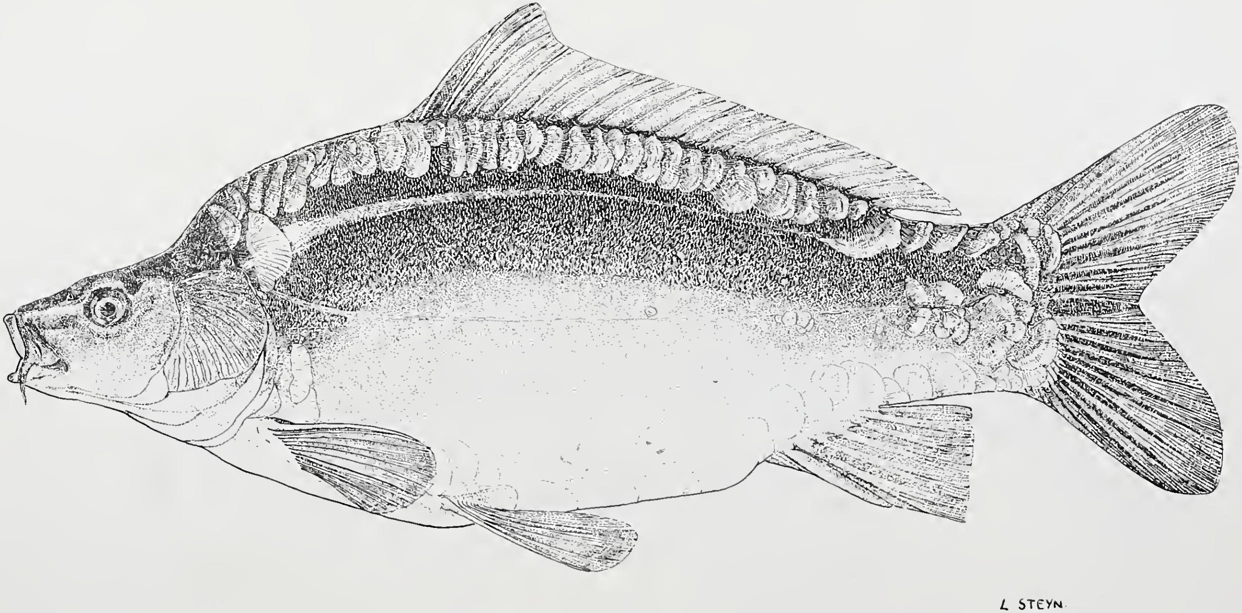

FIG. 20.
Cyprinus carpio Aischgrund var. ex Dinkelsbühl.

THE LARGE-MOUTH BLACK BASS.

Micropterus salmoides.—The American large-mouth black bass (Fig. 19) makes very good eating and its flesh is comparable to that of trout. It is a fast grower and can attain the weight of a pound within a year; the record weight is 10 lb.

This predator which subsists mainly on small fish, is used in *Tilapia* farming to utilize the food not eaten by the kurper and to prevent over-population of production ponds by consuming the small fish which are hatched there.

The large-mouth bass prefers to lay its adhesive eggs on the roots of waterplants or on gravelly patches. Should suitable spawning surfaces be absent in a dam, one can make round platforms out of gravel, pebbles or small stones (up to 3 in. in diameter). These spawning platforms should have a diameter of about 3 ft. and be placed in depths of between 2 and 3 ft. In spring the male will clean these platforms and after the female has laid her eggs on them he will fertlize and guard them. After the fry has hatched they swim about in a concentrated shoal and are guarded by the male until they are about an inch long.

Black bass are stocked in production ponds at a rate of about 10 bass to every 100 *Tilapia.*

CARP FARMING.

Carp, which originally came from the East, has been cultured in Europe for hundreds of years.

The carp illustrated in Fig. 20, is a variety which has been specially bred in Germany for fish-farming after 300 years of selective breeding. The Transvaal Provincial Administration recently imported this variety of fish, specifically for fish-farming, mainly for the cold Highveld where *Tilapia* farming is impossible.

Farmers intending to farm with carp will have to install special screens in the outlet canals to prevent them from escaping into natural waters. If carp are not continually selected, they can easily degenerate by in-breeding.

The Aischgrund carp which has recently been imported, grows rapidly and can attain a weight of 3 lb. in a year's time. This variety distinguishes itself from other carp by its conspicuous high " hump ", thick flesh and distinctive arrangement of scales.

The breeding habits of the carp are quite different from those of the fish that have thus far been discussed. It is, therefore, also important to build special breeding ponds on a carp farm. The best size for a carp-breeding pond is about 24 ft. × 30 ft. with a depth varying between 1 ft. in the middle of the pond to 3 ft. in the bottom canal which runs along the sides of the pond floor to the outlet (Fig. 21a). Because the eggs of the carp are, under natural conditions, attached to water plants, the floor of the dam (*b*) should be planted with a soft grass (sweet grass) which grows to about 1 ft. high; even rye or wheat can be sown for this purpose.

Before the spawning period, which occurs about November, the males and females must be separated. As soon as the water temperatures rise to 19° C. (± 60° F.), one female and two males should be placed in the pond. The males chase the female around and when she lays eggs they fertilize them. This courtship may last for two days. The

1 vt. in die middel van die dammetije tot 3 vt. in die trog of kanaal (fig. 21, a), wat rondom die vloer van die dam na die uitlaattoring loop. Omdat die eiers van die karp aan waterplante vasgeheg word, moet die dambodem (*b*) met 'n sagte gras (soetgras) wat omtrent 1 vt. hoog word of selfs met rog of gars beplant word.

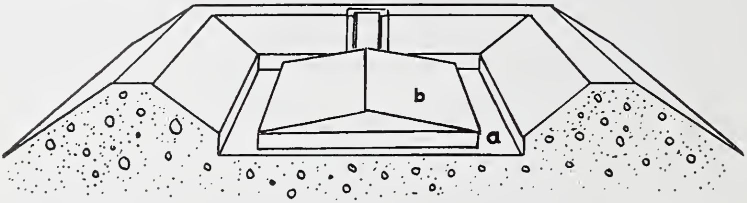

FIG. 21.

Diagram van 'n karp broeidam met duskantste wal weggelaat om die konstruksie van die kanaaltjie (*a*) en die dambodem (*b*) aan te toon.

Diagram of a carp breeding-pond with the nearest wall left out to show the construction of the canal (*a*) and the dam floor (*b*).

Voor die broeityd, wat omstreeks Novembermaand val, moet die mannetjies en wyfies apart gehou word. Die broeidamme moet gevul word sodra die watertemperatuur 19° C. (± 60° F.) bereik, dan moet een wyfie en twee mannetjies daarin gesit word. Die mannetjies jaag dan die wyfie rond en as sy die eiers lê, sprei hulle homvog daaroor om die eiers te bevrug. Hierdie proses kan tot twee dae duur. Die eiers sak dan af in die water en sit vas aan die grasblare en -halms. Alle eiers wat tot op die bodem sak broei nie uit nie. 'n Wyfie van 4 tot 5 lb. kan tussen 400,000 en 500,000 eiers lê. Daar is egter 'n baie hoë persentasie van die eiers en kleinvis wat verlore gaan.

Direk nadat die eiers gelê is, moet mens baie vroeg in die oggend voordat die son warm word, die water in die broeidam laat sak en die drie broeivisse verwyder, waarna die dam weer dadelik tot sy normale waterstand gevul moet word voordat die eiers droog word. Hierdie voorsorgmaatreël is nodig omdat die karp geneig is om hulle eiers te vreet.

Binne 'n paar dae broei die kleintjies uit en 3 dae nadat hulle uitgebroei het, as hulle omtrent 'n $\frac{1}{4}$ dm. lank is, moet hulle met 'n fyn net uitgevang word en na die voorstrekdamme oorgeplaas word. Om die laaste vissies te bekom, moet die water baie stadig laat sak word sodat die kleintjies in die bodemkanaaltjie (fig. 21, a) versamel, waaruit hulle dan met 'n vierkantige skepnetjie, wat presies in die kanaaltjie pas, geskep word. 'n Baie fyn sif moet by die leegmaak van hierdie dam gebruik word, sodat geen klein vissies kan ontsnap nie. Om platannas uit die broeidam te hou is dit raadsaam om 'n drie voet hoë heining, wat effens buitentoe oorhel, van kuikendraad om die dam aan te bring.

As die karpies dan in die voorstrekdam 'n lengte van omtrent $1\frac{1}{2}$ dm. bereik, kan hulle na die produksiedamme oorgeplaas word.

Die jong vissies leef hoofsaaklik van zooplankton en vreet later ook plantaardige voedsel en benthos wat uit die bodem gehaal word. Die karp kan met sukses kunsmatig gevoer word met lupinesaad, mielies, koring, ens. Omdat mielies in Suid-Afrika maklik bekombaar en relatief goedkoop is, sal dit hier meesal gebruik word. Vandat die vissies omtrent ses weke oud is, kan hulle met griesmeel, wat effens growwer as

eggs settle on the grass, leaves and stalks and eggs which fall to the bottom do not hatch. A female of 4—5 lb. can lay between 400,000 and 500,000 eggs. A large number of eggs and fry, however, are lost.

As soon as the eggs have been laid, the pond must be drained very early in the morning before the sun gets too hot. The big fish must be removed and the pond immediately refilled to its former level, before the eggs have a chance to dry. This precaution is necessary because the carp are inclined to eat their eggs.

Within a few days the fry hatch and three days later, when they have attained a length of ¼ in., they should be gathered with a very fine net and transferred to the nursery ponds. To capture any remaining fry, the water should be drained gradually so that the small fish are collected in the bottom canal from which they can be taken with a rectangular scoop net which should be made to fit into the canal. A very fine screen should be used in the emptying of this dam to prevent any fry from escaping. To prevent platannas (the clawed toad, *Xenopus laevis*) from getting into the breeding pond it is advisable to construct a 3 ft. high fence of chicken wire around the pond. This fence should lean slightly outwards to make it frogproof.

When the fry have reached a length of about 1½ in. they can be transferred to the production ponds.

The young fish feed mainly on zooplankton and afterwards include vegetable matter and benthos which is taken from the bottom, in their diet. Carp can be artificially fed very successfully with lupin seed, mealies (maize), wheat, etc. Because mealies are readily obtainable and relatively cheap in South Africa it will be the food most commonly used. From the age of six weeks the fingerlings can be fed on groats (middlings) which is slightly coarser than mealiemeal. From the tenth week the fish can get mealie rice (maize grits) and large fish can eat crushed or stamped mealies or even whole mealies.

Ponds for carp farming should slope *very gradually* from not less than 2 ft. to the deepest part. This gives the fish a large natural feeding ground. When feeding the carp, the food should always be given on specific places at a depth of about 2 ft. 6 inches. In this way one can ascertain whether all the food has been taken before the next feeding time. Accumulation of food permits fermentation and souring which can have detrimental effects on the fish.

As we have only just begun with research on carp in South Africa, nothing can as yet be said about stocking rates and initially we will have to rely on European results. The textbooks mentioned in the literature list should be consulted for further information.

TROUT FARMING.

The rainbow trout (*Salmo gairdneri*, Fig. 22) of North America is a fast-growing fish which is suitable for commercial production in ponds. It is a coldwater fish which will thrive only in the cold, clear water of the Highveld and the escarpment. The most important requirement for a trout farm is a perennial supply of water of at least 2 cusecs, i.e. ± 50 litres or 12½ gallons per second; the temperature of the water should never rise above 20° C. (68° F.). On account of its low oxygen content, borehole water is not at all suitable. In trout farming it is even more important than in other fish-farming that the water be chemically pure

mieliemeel is, gevoer word. Vanaf hulle tiende week kan die vissies mieliegruis kry en groot vis kan selfs met stampmielies of heel mielies gevoer word.

Damme vir karpboerdery moet van baie vlak (nie minder as 2 vt. nie) *baie geleidelik* dieper word sodat die vis groot natuurlike weiplek het. Die voedsel moet egter gereeld op spesifieke voerplekke op 'n diepte van omtrent 2 vt. 6 dm. gegooi word, sodat mens kan vasstel of al die kos opgevreet is voordat die vis weer gevoer word. Ophoping van voedsel laat dit suur word en kan nadelige gevolge hê.

Omdat navorsing in verband met karpboerdery nou eers in Transvaal begin word, kan ons nog niks bepaalds oor besettingsdigthede sê nie en moet ons ons aanvanklik verlaat op Europese gegewens. Die handboeke wat in die literatuurlys genoem word kan vir verdere inligting nageslaan word.

FORELBOERDERY.

Die Reënboogforel (*Salmo gairdneri*, fig. 22) van Noord Amerika is 'n vinniggroeiende vis wat geskik is vir kommersiële produksie in damme. Dit is 'n kouwatervis wat slegs in die koue helder water van die hoëveld en die platorand aard. Die belangrikste vereiste vir forelboerdery is 'n sterk stroom water van minstens twee kuseks, d.i. ± 50 liter of 12½ gallon per sekonde; die watertemperatuur moet nooit hoër as 20° C. (68° F.) styg nie. Boorgatwater is weens sy lae suurstofgehalte gladnie geskik nie. In forelboerdery is dit nog belangriker as by ander visse dat die water chemies suiwer moet wees en gladnie besoedel moet wees deur fabrieks- of rioolafval nie. Die grootte van die damme kan wissel van 200 tot 1,000 vierkante jaart met 'n gemiddelde diepte van 6 vt. 6 dm.

In hulle natuurlike toestand gaan forelle in die wintermaande stroomop om te broei. In die forelkultuur word hulle gestroop; dit wil sê die eiers word uit die wyfies „gemelk" en dan word die kuit of homvog uit die mannetjies oor die eiers gesprei. Die eiers en klein vissies word dan in broeihuise en later in ronde betontenks versorg. Omdat hierdie 'n ingewikkelde tegniek is, word voornemende forelboere aangeraai om, altans in die begin, hulle vingerlinge van die Provinsiale Visseryinstituut, Posbus 45, Lydenburg, te kry.

Omdat die water altyd deur 'n foreldam moet vloei, is dit nie moontlik om die damme te bemes nie. Die forelboer is gevolglik uitsluitlik aangewys op kunsmatige voeding. Die forel is 'n vleisvreter en kan drie maal per dag op gemaalde vleis gemeng met vismeel of vleismeel gevoer word. Die voedselkwota word bereken op 5% van die vis se gewig per dag en dit neem omtrent 8 pond vleis om 1 pond vis te produseer.

Tensy 'n gereelde bron van baie goedkoop vleis, soos afgekeurde vleis van slagpale, beskikbaar is, kan forelle nie lonend geproduseer word nie. Omdat die vleis altyd vars moet wees, is goeie verkoelingsgeriewe ook noodsaaklik.

Forelle word op 'n ouderdom van nege maande tot een jaar bemark, met 'n gewig wat wissel van 6 ons tot 1 lb. Vir hierdie produksie kan mens die damme beset met van 10 tot 25 vingerlinge per vierkante jaart. Vir 'n konstante produksie van bemarkbare vis moet daar minstens agt damme wees.

Vanweë die hoë produksiekoste is forel 'n luukse kossoort met 'n beperkte afsetgebied in groot stede. Voornemende forelboere moet al hierdie omstandighede in gedagte hou wanneer hulle 'n forelboerdery oor-

and that it should not be polluted by factory or sewage waste. The size of the dams can vary between 200 and 1,000 square yards with an average depth of 4 ft. 6 in.

In their natural state, trout go upstream in winter to spawn. In trout culture the fish are stripped, that is, the eggs are "milked" out of the female and the milt from the male is spread over them. The eggs and fry are first cared for in a hatchery and afterwards in round cement tanks. As this incurs a specialized technique, prospective trout farmers are advised to order their fingerlings from the Provincial Fisheries Institute, P.O. Box 45, Lydenburg.

Because the water always has to flow through a trout pond, it is not possible to fertilize the ponds. The trout farmer is therefore entirely dependent on artificial feeding. The trout is a carnivore and can be fed three times daily on minced meat mixed with fish or meat meal. The food quota has been computed at 5% of the fish's weight per day. It takes ± 8 lb. of meat to produce 1 lb. of fish.

Unless a regular source of very cheap meat, such as condemned meat from abattoirs is obtainable, trout cannot be produced economically. As the meat always has to be fresh, good refrigeration facilities are also necessary.

Trout are marketed at an age of between nine months and one year at a weight of between 6 ozs. and 1 lb. To attain this production the ponds have to be stocked at the rate of 10 to 25 fingerlings per square yard. For a constant supply of marketable fish, there should be at least eight dams.

On account of its high production costs, trout is a luxury food with a limited market in the larger cities. Prospective trout farmers should bear all these facts in mind when they want to start farming with this fish. It is a specialized practice about which good textbooks exist, (Davis, 1953, Schäperclaus, 1933) and about which we will not expound any further.

THE HARVESTING OF FISH.

Tilapia and Carp.—As soon as the fish have reached a marketable size they must be harvested and sorted. With the floating plank replaced by a screen, the sluice planks are pulled up one after the other until the water has drained from the pond to the point where all the fish are concentrated in the deepest part inside the monk. At this stage fresh water must be let through the pond.

In the meantime the screening box is placed into the trap. About two sluice planks in the groove of the trap dams the water to a comfortable depth.

The screen is pulled up until sufficient fish have passed into the screening box, when it should be lowered into position again. The fish are then scooped onto the sorting table with scoop nets. It is important that the sorting table be kept wet. Under each opening or door of the sorting table a drum, half filled with water is placed. A sorter at each opening of the table selects the particular size or species for his drum and slips it through the opening so that it falls into the drum. The market fish go to the marketing dams and the small fish are transferred to new rearing and production ponds or to the black bass marketing dam as fodder.

weeg. Dit is 'n gespesialiseerde boerdery waaroor daar goeie handboeke bestaan. (Davis, 1953; Schaeperclaus, 1933) en waaroor ons gevolglik nie hier verder sal uitwy nie.

DIE OES VAN VIS.

Kurpers en karp.—Sodra die vis 'n bemarkbare grootte bereik het, moet hulle geoes en sorteer word. Met die sif in die dryfplank-groef kan mens die toringplanke een na die ander optrek, totdat die water sover gesak het dat die vis almal in die diepste punt van die dam, binnekant die toring versamel is. Op hierdie stadium moet vars water deur die bodem kanaal in die dam gelaat word. Intussen moet die sifkas in die vangbak geplaas word. Omtrent twee toringplanke in die gleuf van die vankbak gee 'n gerieflike waterhoogte daarin.

Die sif moet dan opgetrek word totdat daar genoeg vis in die sifkas is en dan weer laat sak word. Die vis word dan met skepnette uit die sifkas geskep en op die sorteertafel, wat goed natgehou moet word, gegooi. Onder elke „deurtjie" van die sorteertafel plaas mens 'n halfvol drom water. 'n Sorteerder by elke opening soek dan die spesifieke visse vir sy drom uit en skuif hulle deur die deurtjie sodat hulle in die drom val. Verskillende soorte of groottes word so uitgesoek; die markvis gaan dan na bemarkingsdamme en klein vis kan na nuwe produksiedamme oorgeplaas word, of in die swartbaars markdamme vir voedsel gegooi word.

In sommige gevalle word die eerste visse met 'n treknet geoes en net die laastes deur die leegmaak van produksiedamme in die hande gekry. Karp leer egter baie gou om onder die net deur te swem en kan alleen deur leegmaak gevang word.

Omdat aanhoudende nettery van vis hulle seermaak (dit is veral van toepassing by kurpers in die wintermaande), is dit noodsaaklik om, soos voorheen genoem, verkoopstenks te bou (fig. 23), waarin 'n voorraad markvis altyd vir verkoop gereed gehou kan word.

Forelle.—Deur hulle gevoeligheid kan forelle nie soos ander vis geoes word nie. Die eenvoudigste metode is om die dam te net in die rigting van die inlaat waar daar voldoende varswater is, en die vis dan met skepnette uit die net te haal. Die vis moet dadelik oorgeplaas word na oordekte bemarkingsdamme of tenks waardeur 'n goeie stroom water vloei. Vir meer gespesialiseerde oesmetodes moet forelboere weer verwys word na die betrokke handboeke.

BEMARKING.

Om rou varswater vis te verkoop moet inwoners van Transvaal van die Direkteur van Natuurbewaring, Privaatsak 209, Pretoria, 'n permit kry. Geen tafelvis mag, behalwe na goedkeuring van die Afdeling Natuurbewaring, lewendig verkoop word nie. Dit kan egter toegestaan word waar die vis deur 'n restaurant of handelaar lewendig in akwariumtenks uitgestal word. Vis kan doodgemaak en so aan die verbruiker verkoop word. Die skoonmaak of ontbening van die vis sal die koste natuurlik verhoog en sal sy verkoopsprys laat styg.

Gesoute, gedroogde vis is baie gewild onder sommige Bantoes en hoewel hier heelwat arbeid aan verbonde is, bestaan die voordeel dat die vis sonder verkoelingsgeriewe vir 'n onbepaalde tyd bewaar kan bly.

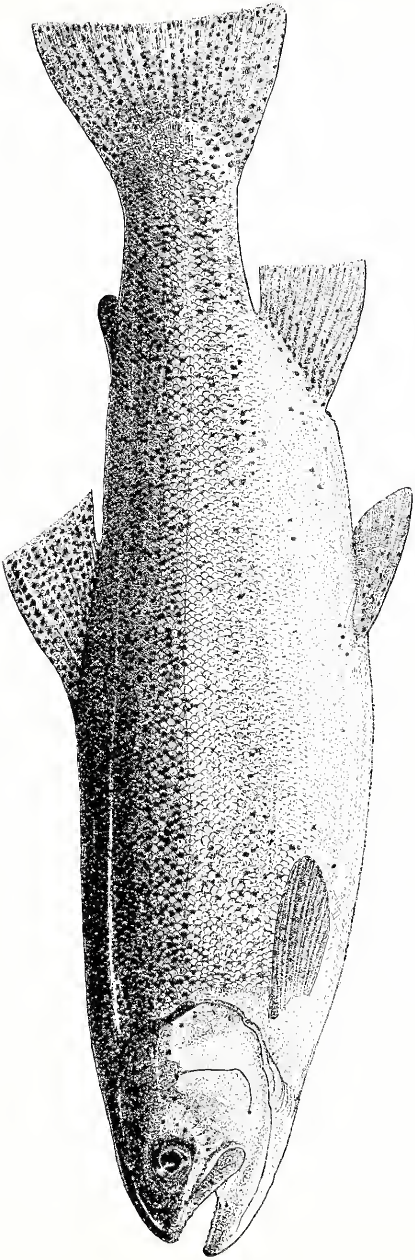

FIG. 22.
Salmo gairdneri.

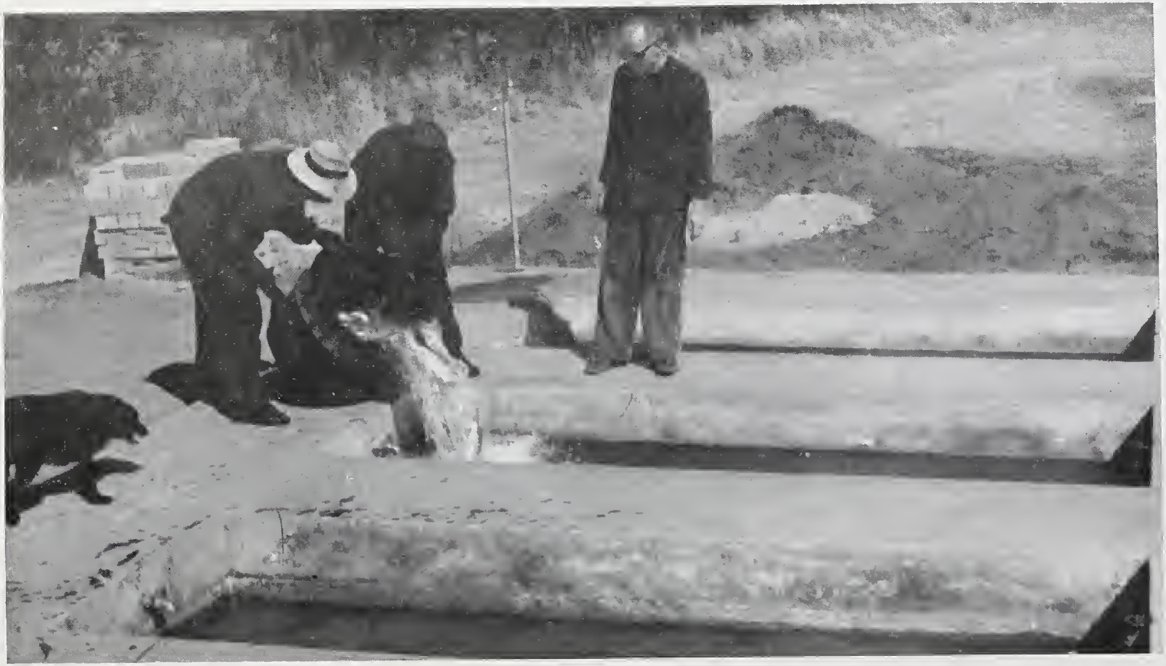

Fig. 23.

Verkoopstenks waaruit vis bemark word.

Marketing-tanks from which fish are sold.

In some cases the first fish are netted with a seine and only the remaining fish harvested by emptying the production dam. Carp, however, very soon learn to escape under the net and can then only be harvested by emptying the dam.

Because constant netting injures the fish (this is particularly applicable to *Tilapia* in the winter months) it is essential, as previously mentioned, to build marketing tanks (Fig. 23), where a supply of table fish can always be kept in readiness for selling.

Trout.—Trout are rather sensitive and cannot be harvested like other fish. The simplest method is to net the dam in the direction of the inlet where sufficient fresh water runs in. The fish are then scooped up out of the seine with scoop nets and immediately transferred to marketing dams, or tanks which are covered with a thatch or reed canopy and through which a strong supply of water flows. For more specialized methods trout farmers are again referred to the textbooks concerned.

MARKETING.

To sell raw freshwater fish, the inhabitants of the Transvaal must obtain a permit from the Director of Nature Conservation, Private Bag 209, Pretoria. No table fish may be sold alive without the approval of the Department of Nature Conservation. This approval is given only in cases where the fish are exhibited alive in aquarium tanks by restaurants or fish-mongers. Fish can be killed and sold without cleaning to consumers. The cleaning and filleting of the fish will naturally increase the production cost and consequently also the price.

Dry salted fish is very popular with some Bantu and although this also involves a certain amount of labour, the advantage is that fish prepared in this way can be stored without refrigeration.

Although the demand for freshwater fish in the Transvaal has only been partly exploited the demand far exceeds the supply. At the Lowveld Fisheries Research Station near Marble Hall, surplus fish is sold on the spot. No advertising is done and we have on two occasions exhausted our supply of fish in the marketing dams.

Since the market has still to be stabilized not much can be said about prices. The minimum, retail prices at present is 2s. per lb. for *Tilapia* and thoroughbred carp, 3s. per lb. for black bass and 8s. per lb. for trout.

FISH PREDATORS.

Cormorants can do a lot of damage in fish ponds. They may be shot without a permit. Apart from eating fish, these birds also act as intermediate hosts for parasites.

Kingfishers are protected birds and the little damage they do, does not warrant any action against them.

Otters can become a nuisance on a fish-farm and may be kept out by an otterproof fence.

Crabs do a lot of damage to dam walls and are most undesirable on a fish-farm.

Hoewel die aanvraag na varswatervis in Transvaal nog nie tot sy reg gekom het nie, is die aanbieding daarvan op die mark nog ver onderkant die huidige behoefte. Op die Laeveldse Visserynavorsingstasie te Marble Hall word die surplus vis ter plaatse verkoop. Daar word gladnie geadverteer nie en die beskikbare vis is al op twee geleenthede uitverkoop.

Waar die mark nog bestendig moet word, kan daar nie veel oor die pryse gesê word nie. Die minimum wat verbruikers egter op die oomblik by die produsent betaal, is 2s. per pond vir kurper en opreggeteelde karp, 3s. per pond vir Swartbaars en 8s. per pond vir forelle.

VISVYANDE.

Kormorante of sogenaamde duikers kan baie skade in visdamme aanrig en kan sonder permit geskiet word. Behalwe dat hierdie voëls vis vreet, is hulle ook draers van parasiete.

Visvangertjies is beskermde voëls en rig in elk geval so min skade aan dat hulle in vrede gelaat kan word.

Otters kan ook op 'n visplaas lastig wees en omheining van die terrein met ottervaste draad sal hulle weghou.

Krappe kan damwalle baie beskadig en is daarom ongewens.

VISPRODUKSIE IN DIE GEWONE PLAASDAM.

Die waarde van vis op die plaas.—Daar is min plase waarop daar nie 'n dam is nie. Sonder veel moeite kan die plaasdam baie plesier aan die plaasmense verskaf. Dit kan goeie ontspanning aan mense van alle ouderdomme verskaf in die vorm van hengel en boonop nog vis vir die tafel lewer. Op baie plase is vleis vir die werksvolk ook 'n probleem. Vis is 'n goedkoop plaasvervanger veral as 'n mens dit self produseer. Die Bantoe het sy vooroordeel teen vis reeds kwytgeraak en is nie kieskeurig oor die grootte van die vis nie. Boere wat dit op proef gestel het vind dat dit betaal om 'n dam spesiaal te bou om vis vir die werksmense te produseer. Hiervoor kan onvrugbare of moerasagtige plekke gebruik word wat vir boerderydoeleindes nutteloos is.

Waar om vis te kry.—Vis is van die Provinsiale Visseryinstituut, Posbus 45, Lydenburg, die Laeveldse Vissery-navorsingstasie, Privaatsak Natuurbewaring, Marble Hall, of die Hartbeespoort Visteelstasie, Poskantoor Hartbeespoort, verkrygbaar. Volle besonderhede kan van hierdie inrigtings verkry word.

Lydenburg en Hartbeespoort spits hulle toe op hengelvis en hengelprobleme, terwyl Marble Hall die aspek van visboerdery behartig. Watter stasie u dan nader, hang af van die doel waarvoor u die vis wil gebruik.

'n Permit word benodig om vis in 'n plaasdam in te voer. Die rede is dat onkundige persone dikwels ongewenste vissoorte in hulle damme invoer, wat nie alleen 'n oorlas in die dam is nie, maar in tye van vloed in die riviere inspoel en daar aanteel tot nadeel van waardevolle soorte. Vis wat in een water as waardevol beskou mag word, mag in ander waters 'n oorlas wees. Vissiektes en parasiete kan ook op hierdie manier in u damme kom.

FISH PRODUCTION IN THE ORDINARY FARM DAM.

The value of fish on a farm.—Few farms are without a dam. The farm people can derive much pleasure from their dam; if stocked with fish it provides recreation for people of both sexes and all ages as well as food for the table. On many farms meat for the labourers presents a problem. Fish is a cheap substitute for meat, especially if produced on the farm. Most Bantu have lost their prejudice against fish and they are not particular about the size of the fish. Farmers have already proved that it pays to build a dam specially to produce fish for labourers. Infertile and swampy land which is useless for agriculture may be used for dams.

Where to buy fish.—Fish are obtainable from the Provincial Fisheries Institute, P.O. Box 45, Lydenburg, the Lowveld Fisheries Research Station, Private Bag Nature Conservation, Marble Hall or the Hartbeestpoort Fisheries, P.O. Hartbeestpoort. Full particulars are available from these stations.

Lydenburg and Hartbeestpoort concentrate on angling and angling problems whereas the Marble Hall station is primarily interested in fish-farming. The purpose for which fish are required will determine which station to approach.

A permit is needed to introduce fish into a farm dam. The reason for this is that ignorant persons often introduce undesirable fish into their dams. In this way the dam may become useless for more desirable kinds. Moreover these fish escape during floods to populate the rivers to the detriment of better species. Fish regarded as desirable in one water may be extremely undesirable in another. Fish diseases and parasites may also be introduced into dams in this way.

Farmers are advised not to obtain fish from their neighbours, but to ensure that they stock with a suitable species and healthy specimens by ordering fish from one of the above addresses.

Farm dams suitable for fish.—Although every dam will be able to carry some or other kind of fish not all dams are favourable to fish life. **Cement reservoirs** are not very satisfactory on account of their small size and lack of natural food. Most desirable fish are unable to breed in such a reservoir. The fish must be fed artificially but even then one must not expect too much.

Earthern dams larger than $\frac{1}{4}$ acre (1,200 sq. yds.) are most suitable for fish, provided that the water level does not drop too often due to irrigation. In small irrigation dams natural food is also scarce because it gets washed out with the water. In Spring and early Summer when the fish breed one should try and keep the water-level as constant as possible.

Conservation dams and **stock dams** provide better conditions for fish as the water is not replaced so frequently and natural food can develop properly. Cattle should be allowed to drink at one place only to avoid the banks being trodden down and for this reason a fence should be erected around the dam. In contrast to new dams where the topsoil has been removed, new dams in which the topsoil has been submerged are extremely fertile for the first few years. Muddy water has a low fertility because sunlight, which is essential for the growth of algae, cannot penetrate. The mud in suspension also creates unsuitable conditions for the small animals on which many fish live. For more detailed information we refer to the chapter on the **natural food of fish** and **fertilizers.**

Boere word aangeraai om nie vis van die buurman te kry nie, maar dit liewer van die bogenoemde adresse te bestel en sodoende seker te maak dat die regte soort en gesonde vis ingevoer word.

Plaasdamme wat geskik is vir vis.—Alhoewel enige dam vis van een of ander soort kan dra, is alle damme nie gunstig vir vis nie. **Sementdamme** is nie baie geskik vir vis nie omdat hulle maar min natuurlike voedsel bevat en gewoonlik ook baie klein is. Die meeste soorte kan ook nie in so 'n dam broei nie. In 'n sementdam moet die vis gevoer word, maar selfs dan moet 'n mens nie te veel verwag nie.

Gronddamme van groter as 'n kwart akker (1,200 vk. jrts.) is baie geskik vir vis mits hulle nie dikwels byna leeg gelei word nie. In leidamme is die natuurlike voedsel ook maar skaars want dit word met die leiwater uitgespoel. Veral in die voorjaar en vroeë somer as die vis broei, moet mens probeer om die waterhoogte so konstant moontlik te hou. Damme wat vir grondbewaringsdoeleindes of vir veesuiping gebou is, is die beste vir vis, want hier word die water nie so dikwels vervang nie en kan die natuurlike voedsel ordentlik ontwikkel. Waar vee suip, moet die dam se oewers teen uittrapping beskerm word en daarom is dit wenslik om die dam te omhein en die vee net op een plek vir suiping toe te laat. Nuwe damme waarvan die bogrond van die dam verwyder is, is baie onvrugbaar vir die eerste paar jaar, terwyl damme met bogrond in die bodem vir die eerste paar jaar besonder vrugbaar is. Modderige water het ook 'n lae vrugbaarheid omdat daar nie veel sonlig binnedring nie en omrede troebel water ongunstig is vir die klein waterdiertjies waarop klein vissies lewe. Vir nadere inligting in hierdie verband verwys ons u na die hoofstuk oor **Natuurlike Voedsel Van Vis** en **Bemesting Van Damme.**

Omdat die gewone plaasdam nie vir bemesting drooggelê kan word nie, kan die kalk, net soos die ander misstowwe oor die wateroppervlak gestrooi word. Die fosfate moet ook weer twee weke na die kalk toegedien word.

In sementdamme kan mens in die laeveld in paar rooivinkurpers en in die hoëveld karp, wat gevoer sal moet word, aanhou. Omdat die kurpers in 'n sementdam sal broei, raak hulle gou oorbevolk en moet drasties uitgedun word. Alhoewel swartbaars nie in 'n sementdam sal broei nie, kan 'n paar bygegooi word om die getalle te beheer.

In gronddamme kan die grootbekswartbaars gebruik word saam met rooivin- of bloukurpers in die laeveld en vleikurpers op die hoëveld. Verdere besonderhede oor hierdie vissoorte verskyn elders in hierdie handleiding. Omdat geelvis so stadig groei en swak aanteel in plaasdamme, word hy nie aanbeveel nie. Die blouwangsonvis wat voorheen gebruik is as voervis vir swartbaars moet ten alle koste vermy word. Hierdie uitheemse vis raak spoedig oorbevolk en vreet dan die eiers van die swartbaars op. Uiteindelik is die dam dan vol klein verpotte sonvis wat vir hengel of eetdoeleindes nutteloos is. Alhoewel karp 'n geskikte vis is vir intensiewe boerdery, kan hy in 'n gewone plaasdam ongewens wees. Hierdie visse het 'n neiging om in die modder agter kos te vroetel en as daar baie karp is, word die water so troebel dat vee dit nie wil suip nie en ander vis ook nie daarin kan aard nie.

Waterplante.—Daar is twee soorte waterplante wat in plaasdamme groei. Die oewerplante soos riete, biesies en papkuil, groei somtyds in die water en kan die hele dam inneem. Hulle is vir vislewe heeltemal nutteloos en behoort uitgeroei te word. Dit kan met sekels afgesny of,

Seeing that the ordinary farm dam cannot be drained for fertilization, the lime can be applied by spreading it as evenly as possible over the water surface in the same way as other fertilizers are applied. The phosphates are again applied two weeks after the lime.

In cement dams or reservoirs in the Lowveld a few red-finned kurper can be kept and in the Highveld a few carp. These fish will, however, have to be fed. As the kurper will breed in a cement dam, they very quickly become overpopulated and have to be thinned drastically. Although black bass will not breed in a cement dam, a few can be introduced with the kurper to control their numbers.

In earthern dams the large-mouth black bass can be used together with red-finned or red-breasted kurper in the Lowveld and with the vlei kurper in the Highveld. Further particulars on these fish occur elsewhere in this manual. On account of its slow growth the stocking of yellowfish is not advised. The yellowfish does not breed well in dams either. The Blue-gill sunfish, which was formerly used as a forage fish for black bass should be avoided under all circumstances. This exotic fish becomes overpopulated very soon and then consumes the eggs of the black bass. This results in a dam full of stunted sunfish which are useless for either angling or the table. Although carp is suited to intensive farming, it can be most undesirable in a farm dam. These fish tend to feed on the bottom mud, and where carp are plentiful the water becomes so muddy that stock will not drink it and other fish will deteriorate.

Aquatic plants.—Two groups of water plants occur in farm dams. Marginal plants like reeds and bulrushes may grow into the dam. They are useless to fish-life and should be eradicated. These weeds may be cut with sickles or dug up when the dam is empty. Water-lilies are attractive but some species increase to such an extent that they make fishing well-nigh impossible. Submerged aquatic plants are also undesirable because of the tendency to spread over the entire dam. This not only interferes with angling, boating and swimming but the dense thickets provide such good cover for small forage-fish that the predatory species cannot get at them. This leads to overpopulation with small fish. These plants also compete with algae for the available elements of fertility. The only fish that will eat these submerged weeds is the redbreasted kurper (*Tilapia melanopleura*) which unfortunately thrives only in the Lowveld. Highveld farmers will therefore have to control these weeds by mechanical means. Ducks help to control it in shallow water, but they cannot reach deeper than 2 ft. A sickle tied to a long stick is useful for reaching the plants in deep water. A special equatic weed-cutter consisting of a thin steel cable with weights and blades which is jerked through the water is also available.

Birds.—Ducks and geese are useful on a dam because their droppings make a valuable fertilizer. Wild aquatic birds are not only harmless but very attractive on a dam and should be encouraged. The only bird that can harm the fish is the cormorant.

Harvesting the fish crop.—Many farmers take considerable trouble in stocking their dams and then they allow fishing to deteriorate because they do not catch enough fish. The life-span of a fish is limited and if not used it will only die of old age. If the fish are not reaped they will become overpopulated and stunted. Judicious harvesting of the fish will also help to maintain the balance between game and forage fish. A young fish tastes better than an old one, so reap the fish early and regularly. If one harvests by angling, the fish serve a double purpose namely pleasure and food. Many farmers do not have the time to angle

as die dam leeg is, met wortel en al uitgehaal word. Waterlelies is mooi, maar sommige soorte vervuil so dat 'n mens beswaarlik kan hengel. Die plante wat heeltemal onder water groei, is ook onwenslik in 'n dam. Hulle het ook 'n neiging om te vervuil, aangesien daar baie min visse is wat sulke plante vreet. As hulle vervuil bemoeilik hulle die hengel. Die digte ruigtes bied ook sulke goeie skuiling aan klein vissies dat roofvisse hulle nie kan bykom nie. Die gevolg is 'n oorbevolking met klein vissies. Die plante ontgin ook die vrugbaarheid van die water, ten koste van die alge, wat in vislewe van baie groot waarde is. Die enigste vis wat hierdie soort waterplant vreet is die rooiborskurper (*Tilapia melanopleura*). Ongelukkig leef hy net in die laeveld. Hoëveldse boere sal die waterplant dus maar met die hand moet uitroei. Eende help ook om die watergras in vlak water te bestry, maar hulle kan nie dieper as 2 vt. bykom nie. As mens 'n sekel aan 'n lang stok vasbind, kan die plante diep onder die water afgesny word. Daar is ook spesiale snyers beskikbaar, wat bestaan uit 'n dun staalkabel met gewiggies en messies wat mens heen en weer deur die water trek.

Voëls.—Eende is nuttig op 'n dam, want hulle mis is baie ryk. Visdamme met eende produseer dan ook meer vis. Wilde watervoëls is nie net onskadelik nie maar ook baie aantreklik op 'n dam. Die enigste voël wat skade kan aanrig is die duiker.

Insameling van visoes.—Meeste boere doen groot moeite om vis in hulle damme te kry en dan laat hulle toe dat die vis agteruitgaan deurdat hulle nie genoeg vang nie. 'n Vis se lewe is beperk en as mens hom nie vang nie gaan hy dood van ouderdom. As mens suinig is om die vis uit te vang, mag hulle ook deur oorbevolking benadeel word. Oordeelkundige vangste sal ook help om die balans tussen die soorte te behou. 'n Mens moet ook onthou dat 'n jong vis die lekkerste smaak. Daarom moet die vis vroegtydig en gereeld geoes word. As mens met 'n hoek vang dan verskaf die vis natuurlik dubbele plesier, naamlik aan die hoek en op die tafel. Baie boere het egter nie tyd om te hengel nie en dan is 'n net of fuik die beste wapen. Hiervoor moet daar 'n permit aangevra word. 'n Mens kan maar dwarsdeur die jaar hengel, maar van September tot November, wanneer die vis broei, moet daar nie genet word nie.

Stompe en klippe kan baie skade doen aan nette wat daaraan vashaak en moet, waar enigsins moontlik, uit die dam verwyder word. Damme waarin daar diep gate gegrawe is, gee die vis 'n kans om onder deur treknette te ontsnap en hier is die beste tipe net om te gebruik, 'n spannet.

In Suid-Rhodesië word walle of dyke wat van die kante af in die dam inloop gebou en spannette tussen die walle gespan om die vis in die hande te kry (Wallis, 1959). As mens 'n baie groot plaasdam het, kan hierdie metode toegepas word, of mens kan selfs met 'n treknet makliker tussen die klein walletjies net.

'n Fuik soos afgebeeld in fig. 24 kan ook met sukses gebruik word om vis mee te oes. Die grootte van die fuik en die deurtjie waardeur die vis uitgehaal word, hang natuurlik af van die grootte van die vis wat gevang moet word.

Die vraag is nou hoeveel vis mens van 'n dam kan verwag. Dit sal natuurlik baie wissel van dam tot dam. Ons reken egter dat 'n goeie dam sonder bemesting van 150 tot 250 lb. vis per akker per jaar kan produseer. Deur bemesting kan dit opgeskuif word na 500 lb. en hoër.

and then a net or trap (Fig. 24) is recommended. For this purpose a permit should be obtained. One can angle throughout the year, but between September and November, when the fish spawn, netting should be stopped.

Tree stumps and rocks can do a great deal of damage to nets which get entangled in them and where at all possible, these obstacles should be removed from the dam. Dams in which deep holes have been excavated, afford the fish an opportunity of escaping under seine nets and here the best type of net to use is a gill-net.

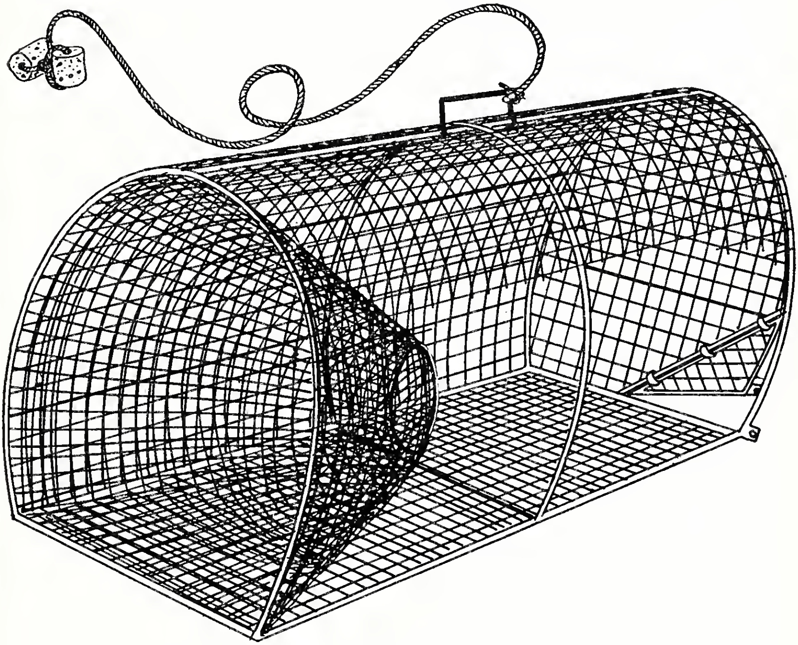

Fig. 24.

Trap According to Macan, Mortimer and Worthington 1942.

Fuik volgens Macan, Mortimer en Worthington, 1942.

In Southern Rhodesia walls or dykes are built into the dam from the sides and gill-nets are hung between them to procure the fish (Wallis, 1959). In a large dam this method can be applied or seine nets can be drawn between these walls.

For harvesting, a trap as shown in Fig. 24 can also be used with success. The size of the trap and the door for removal of the fish, depends on the size of fish to be caught.

The question arises as to what production can be expected from a dam. This will vary from one dam to another. We find, however, that a good dam without fertilizer can produce from 150 lb. to 250 lb. of fish per acre per year. By fertilizing this amount can be increased to 500 lb. and more.

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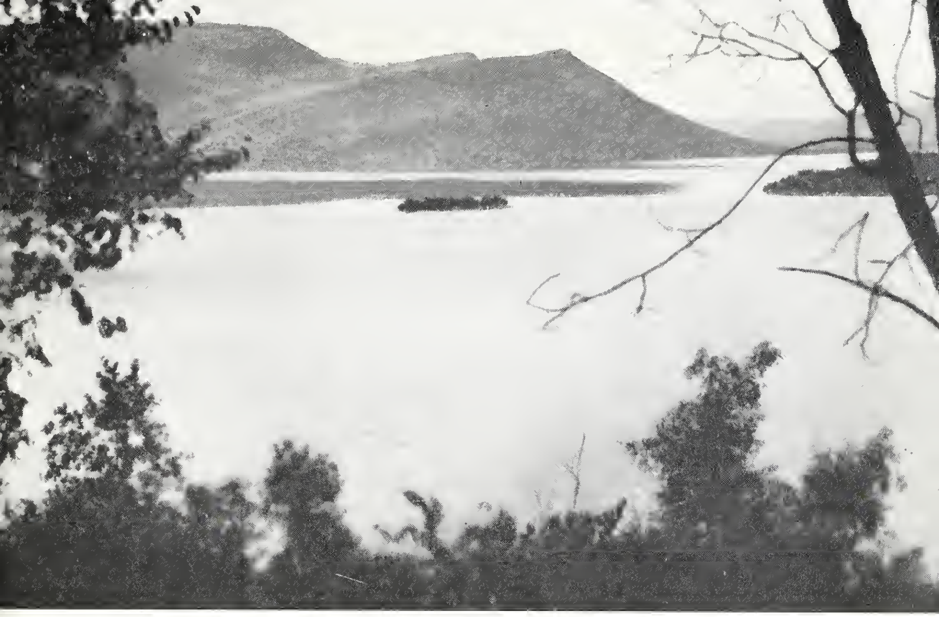

LOSKOP DAM

[Photo : T. B. Verschuur.]

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PHOTO ON COVER 1: White-faced duck (*Dendrocygna viduata*).

ADMINISTRATION OF THE PROVINCE OF TRANSVAAL

Administrator

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Provincial Secretary

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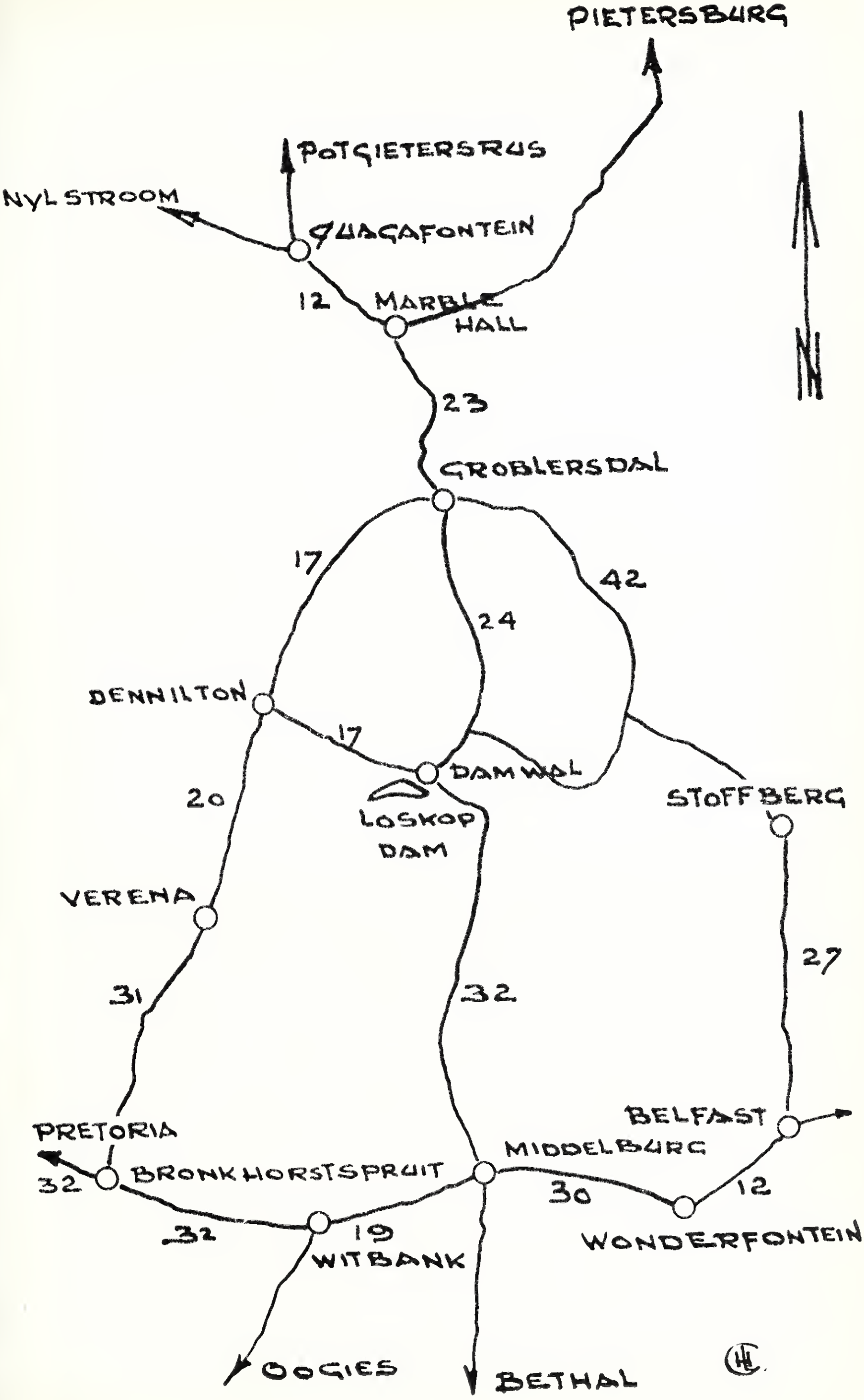
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THE LOSKOP DAM PUBLIC RESORT

> ". . . . it matters not so much what people do when they work as what they engage in when they do not work. The tone of any society is conditioned by the quality of its leisure."
>
> *E. S. & M. H. Neumeyer*

Boats at Loskop.

[Photo: Chris Pisart]

NATURE Conservation means wise use of the renewable natural resources. We deliberately use the word conservation and not protection in order to emphasize the principle that the natural resources should be used to benefit man. We have to distinguish between economic use which may take the form of hunting a buck or a bird, fishing, cutting a tree for firewood or collecting wild fruit and the purely aesthetic value of a walk through the veld, watching and photographing birds and flowers, mountaineering, rowing or a view of an unspoilt landscape.

As our country's industrial development causes an increase in the urban population, there develops a growing need for the people to spend their leisure time in nature. Mindful of this need the Provincial Council in 1953 passed the Public Resorts Ordinance which provided for the establishment of places of public recreation. The Loskop Dam Public Resort was the first of its kind to be established in terms of this Ordinance. The purpose is to provide opportunities for recreation in nature.

The Resort is situated in the Loskop Dam Nature Reserve which consists of 15,000 morgen of mountainous terrain surrounding the Loskop Dam. The summer climate is hot in the day and cool overnight while the winter days are cool and sunny with fairly cold nights. A variety of indigenous trees provide abundant shade in the resort.

On the stoep of a two-roomed bungalow.
[Photo: Chris Pisart]

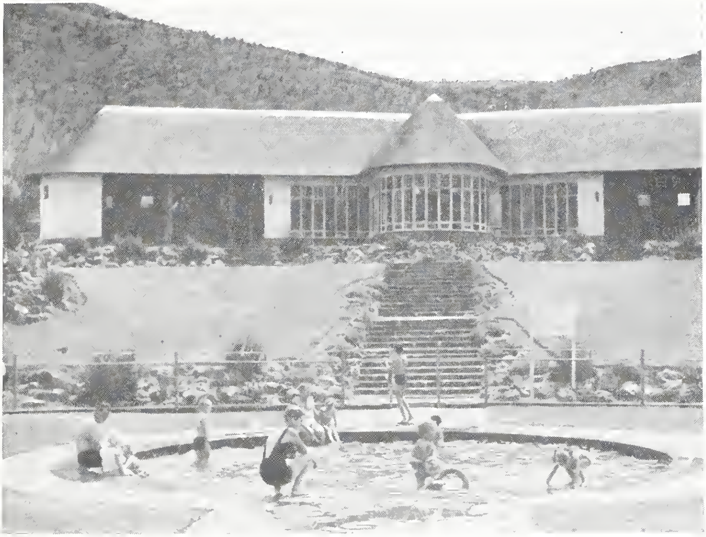
Accommodation consists of comfortable thatched bungalows provided with electric lights and running water. There are family bungalows with a dining-room, two bedrooms, a kitchen, bathroom and toilet; two-roomed bungalows with two bedrooms and a living-room; one-roomed bungalows with four beds and one-roomed bungalows with two beds.

Bedding and towels are provided in bungalows. There is no hot water in the bungalows, but this is provided in the communal bathrooms and showers.

Cooking and eating utensils are not provided. There are communal kitchens with stoves, hot water and washups. Outdoor barbecues are available and fire-wood and coal may be bought in the resort. Meals, groceries, refreshments and petrol are available at the restaurant.

RECREATIONAL FACILITIES

Angling.—Loskop Dam is a well-known angling resort visited by many anglers. Some bring their own boats or fish from the shores, but boats may also be hired.



Restaurant and paddling pool.

[Photo: Chris Pisart]

Boat trips.—Visitors may go for pleasure cruises on the dam in a 37 foot boat or hire small rowing boats.

Swimming.—There is a swimming bath and paddling pool for children.

Tennis.—Two tennis courts are available to visitors. Although, strictly speaking, this is out of place in a public resort where the emphasis is on recreation in nature, the tennis courts are nevertheless useful for filling idle moments with healthy bodily exercise. The policy is not to encourage competitive sports in a public resort.

Playing.—Next to the swimming bath is a playing park for children with green lawns and plenty of shade trees.

Hiking.—A network of nature trails provide the opportunity for visitors of all ages to go hiking in the veld and up the mountainside behind the resort. The dam, the resort and the surrounding mountain landscape may be seen from the top of the mountain. Many indigenous trees growing along the nature trails have their names on a plate against the trunk.

Bird Watching.—The Public Resort and Nature Reserve are rich in bird life. The smaller species are attracted to the resort by regularly placing food in certain spots. Birds are also plentiful along the nature trails and bird lovers who bring their field glasses and Roberts' " Birds of South Africa " will be richly rewarded.

THE NATURE RESERVE

The Nature Reserve carries a variety of game and birds. A 25-mile network of roads often leads to the tops of the highest hills, from where one has a fine view of the surrounding country.

As from 1961 visitors will be taken by bus on conducted tours through the reserve. The idea is firstly to help them to make their visit to the reserve interesting and educational and secondly, to prevent a large traffic of cars making it unpleasant for both the visitor and the animals.

Particulars on the geology, plant and animal life, etc., of the reserve may be found further on in this booklet.

All enquiries and bookings to be addressed to:—

The Manager,
Loskop Dam Public Resort,
Private Bag Damwal,
via MIDDELBURG, TVL.

Telephone: Damwal No. 2.

THE ORIGIN AND BUILDING OF LOSKOP DAM

Contributed by officers of the Department of Water Affairs and published by the kind permission of the Director of Water Affairs

LOSKOP Dam is one of three major conservation dams constructed by the Department of Water Affairs during the years 1934 to 1938, the other two being Vaaldam and Kalkfontein Dam. Loskop Dam together with its canal system was built to serve approximately 18,000 morgen of land to be developed for irrigation under close settlement. The clearing of land, layout of plots, building of houses and placement of settlers were undertaken by the responsible State department, viz. the Department of Lands.

The scheme to develop the water and land resources of the Great Olifants River Basin was first reported on by the Transvaal Irrigation Department in 1907 but remained dormant until the early 1930's when the policy of spending State funds on irrigation projects as a means of relieving the then prevailing depression revived interest in the proposal.

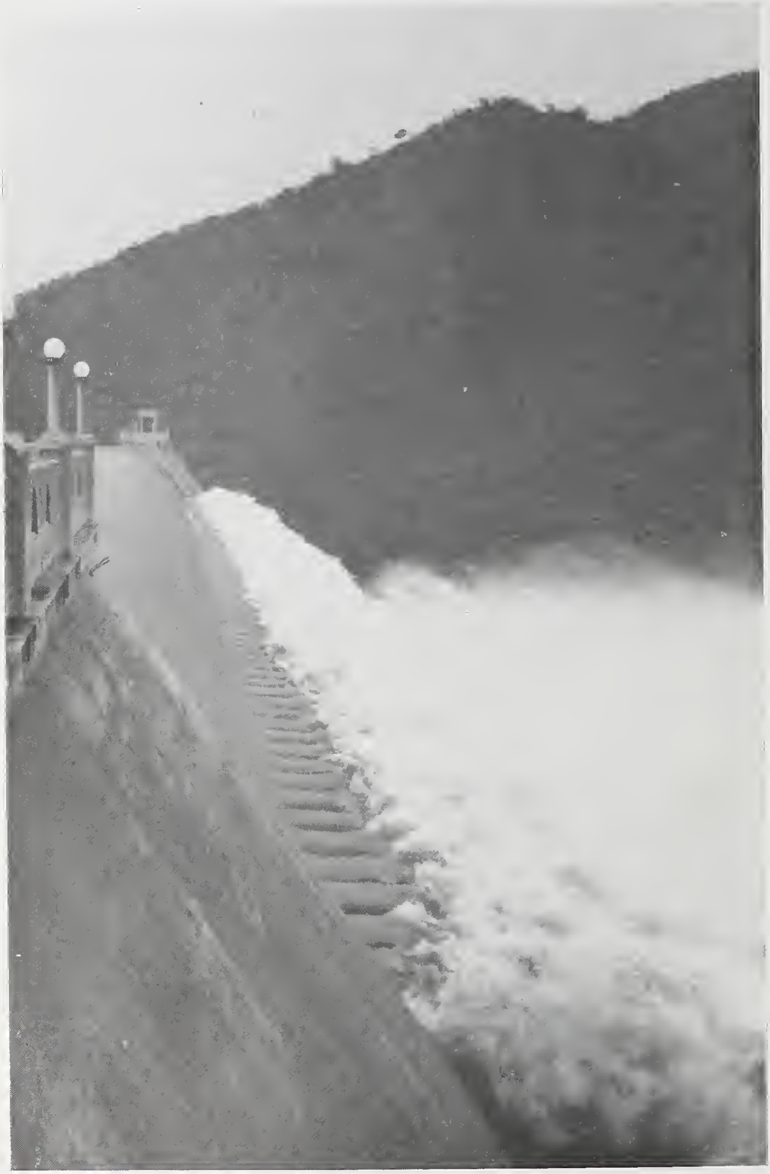
Meanwhile in 1926 a group of farmers had succeeded in forming the Hereford Irrigation Board with the object of building a canal system with intake nine miles below Loskop Dam site and to serve 2,400 morgen of land riparian to the Olifants River. The works were completed during 1929/30 and the Hereford Scheme became the pilot undertaking that paved the way for the national project which was to follow.

In 1933 the Department of Water Affairs undertook a detailed topographic survey of the dam basin, while soil surveys of the irrigable area were carried out for the major scheme by the Division of Chemical Services of the Department of Agriculture.

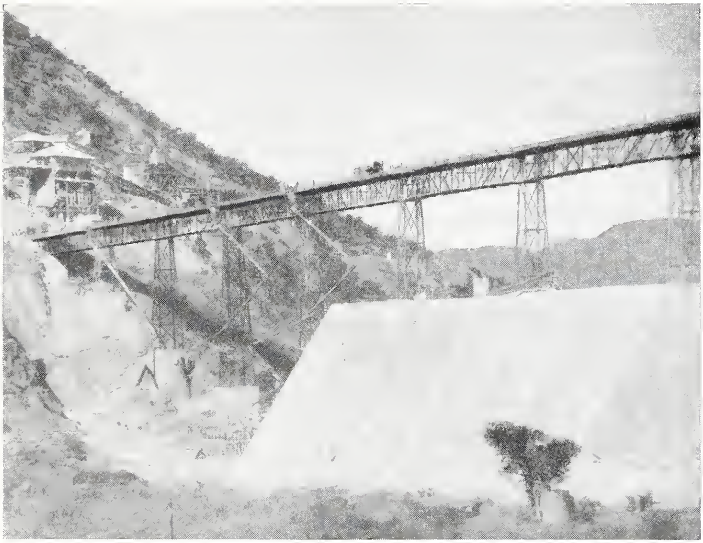
A government commission inspected and reported on the results achieved by the Hereford farmers and early in 1934 the Cabinet decided to provide for the construction of the Loskop Scheme in the 1934/35 parliamentary estimates. Construction operations at Loskop Dam commenced in July, 1934 and were completed early in 1938. At the time of its completion the dam wall contained the largest volume of concrete placed in any single structure in the Union. Since then it has been surpassed by the enlarged Vaaldam which is now the larger concrete mass.

The volume of water impounded by Loskop Dam is greatly exceeded by that stored by Vaaldam while the capacity of the Kalkfontein Dam in the Orange Free State is double that of Loskop Dam. Lake Mentz on the Sundays River near Jansenville has a capacity 40 per cent greater than that of Loskop Dam. Hartbeestpoort and other well-known storage dams in the Union have smaller storage capacities.

The Loskop Dam is a mass gravity overspill type concrete wall rising 110 feet above river bed and in places the foundations go down 35 feet below river bed. This type of wall is not reinforced and withstands the pressure of the water entirely by virtue of its own weight. The dam wall consists of a series of independent sections each 50 feet in length. For the



Flood 9 feet 3 inches high passing over the dam on 31st December, 1955.



Dam under construction. Concreting chutes can be seen suspended from the bridge. Buildings on upper left cover the stone crushing and concrete mixing plant.

[Photo: Stanley Whitaker]

purpose of moving the large volumes of concrete to be placed, a high bridge was constructed over the full width of the valley and concrete was transported by Diesel locomotives hauling coco-pans from the mixing station across the bridge to the point needed, whence it was sent down chutes to the lift which was being placed.

Technically one of the most interesting features of the dam is the method adopted of dissipating the energy of water falling over the spillway. At high flood about half a million gallons pass over the crest each second producing about one million horse-power which, if not effectively dissipated, would pound and batter the river bed immediately below the dam. Engineers of the Department of Water Affairs after a considerable amount of experimentation evolved the splitter design which was successfully incorporated in the crest of the dam.

By the correct placing of suitably proportioned splitters and a step, it was found possible to break up the falling water into a spray, consisting of water with up to twenty times its volume of entrained air. Instead of a concentrated sheet of falling water, the apron now receives a widely dispersed spray which is non-destructive of foundations. A striking feature is that when the spray hits the apron of the dam, the entrained air is expelled in a blast which reaches great force at times of high flood. Carried by this high wind, spray is flung in a horizontal sheet of driving rain for hundreds of yards down the valley, while the undergrowth is flattened and trees bow under the man-made gale.

To the sightseer, the action of the splitters under low flow is equally interesting. A thin sheet of water passing over the crest of the dam is broken by the splitters into a pattern of lacy veils, which slide down the face of the dam.

Statistically the main features of the dam are as follows:—

(*a*) Catchment area: 4,730 sq. miles (the upper reaches are near Breyten in the east, and Bapsfontein in the west);

(*b*) Capacity: 70,000 morgen feet (approximately 40,000 million gallons);

(*c*) Maximum height of spillway: 110 ft. above river-bed, 146 ft. above foundation;

(*d*) Length of spillway: 925 feet;

(*e*) Full length of wall: 1,420 feet;

(*f*) Surface area of full dam: 6·5 square miles;

(*g*) Volume of concrete in wall: 308,000 cubic yards (approximately 600,000 tons);

(*h*) Completed cost: £641,000.

Construction of the canal system by the Department of Water Affairs, was started in June, 1935. Work was suspended in 1940 on account of the outbreak of the Second World War, but by that time the scheme was well advanced and water was already being delivered to a large area.

General view of dam.

Construction restarted towards the end of 1943, and the scheme was in full operation by 1948. The canal system cost £1,605,000.

Two main canals take off from the dam.

The Right Bank Main Canal, which is the one seen by most visitors, is the smaller of the two, and it serves the irrigable area to the east of the Olifants River down to Groblersdal. From the right bank flankwall of Loskop Dam, the visitor looks down upon the sluices which control flow to the Right Bank Main Canal, as also upon two concrete buildings on the banks of the canal. The larger of the two buildings houses a small generating set which is operated by water released into the river for the Hereford Canal. The smaller building contains a pumping unit which supplies water to the houses and gardens near the dam.

The Left Bank Main Canal, which is not readily accessible at the dam, crosses the road to Dennilton about four miles downstream, and serves a much larger irrigable area, extending down to the Elands River beyond Marble Hall.

An intricate system of distribution canals takes off from the two main canals. All canals are concrete lined.

The main details of the canal system are as follows:—

Right Bank Main Canal:—

Length.............	31 miles;
Capacity at head...	65 cubic feet per second (approximately 35 million gallons/day);
Area served........	2,244 morgen.

Left Bank Main Canal:—

Length.............	60 miles;
Capacity at head...	360 cubic feet per second (approximately 195 million gallons/day);
Area served........	16,578 morgen.

Distribution Canals:—

Length.............	208 miles;
Capacities..........	From 45 cubic feet per second to 1½ cubic feet per second.

The Loskop Scheme now serves 18,822 morgen of irrigated lands, on which 636 families are settled. The main crop is tobacco, with wheat and mealies as rotation crops. The gross value of these crops in 1958 was £832,000.

As experience of farming conditions grows, larger areas are being planted to higher paying crops.

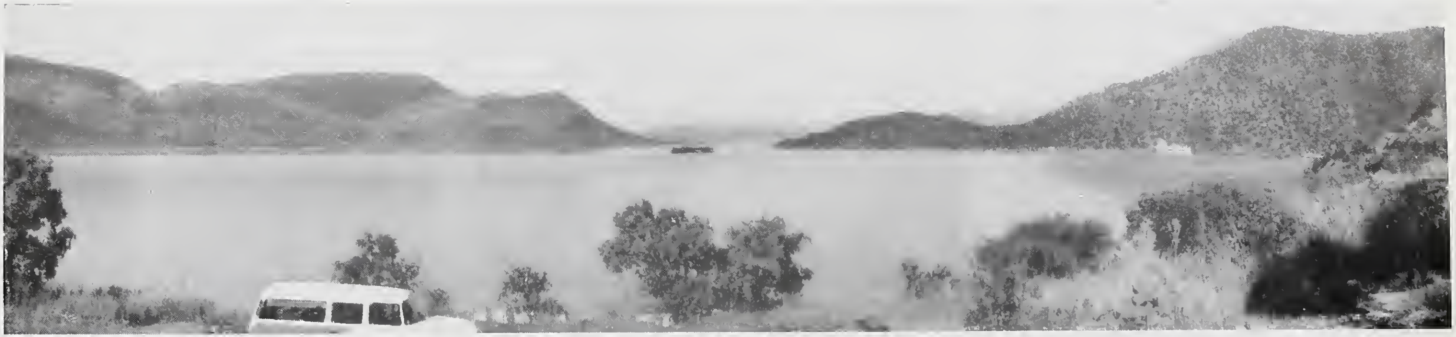


Fig. 1.—Panoramic view of Loskop Dam, looking south-west from the quarry on the main road. The hills on the left are built of south-dipping Waterberg sediments. The valley of the Olifants River, occupied by rocks of the Loskop System, can be seen in the far distance. On the right the hills consist of Rooiberg felsite while Carree's Kop (in centre of photo) and the island are both composed of granite porphyry.

THE GEOLOGY OF THE LOSKOP DAM NATURE RESERVE

By Dr. W. J. van Biljon

GEOLOGICAL HISTORY OF THE REGION

MORE than 2,000 million years ago the crust of the earth was still relatively unstable. Volcanism was active in the central Transvaal and lava of granitic composition (Rooiberg felsite) was poured out over a large area, stretching from the vicinity of the present Potgietersrus to an area east of Middelburg. The volcanicity, which was interrupted by short periods of sedimentation, eventually culminated in the emplacement of the Bushveld Complex.*

Towards the end of the formation of this well-known basic complex, subsidence of the crust took place with the formation of a series of large shallow inland lakes—the southernmost of which occupied a position between the present Loskop Dam and Middelburg. From the mountains surrounding this lake, weathered material, consisting of pebbles, sand and mud, was washed into the basin. A pebble layer formed first at the bottom of the lake and was followed by alternating layers of sand and mud until a thickness of more than 3,500 feet of sediments had accumulated: these are known as the Loskop System. This concluded the first major period of sedimentation in post-Bushveld times.

As a result of earth movements uplift took place and the newly formed sediments were locally contorted and exposed on the surface. Agents of erosion acting on these sediments then levelled them off to form a large flat peneplain.

At this stage subsidence began again and a new large depression formed more or less coinciding with the previous basins but stretching further north and into Bechuanaland. This marked the beginning of the second major period of sedimentation in post-Bushveld times. Vast amounts of sand with intermittent pebble layers were washed into this new basin until a thickness of about 6,500 feet of sediment was deposited and is known as the Waterberg System.

Once again these sediments were exposed to the surface and eroded. After a long period, subsidence again took place, now resulting in a large inland basin which covered nearly the whole of Southern Africa. This was about 250 million years ago. Sediments were also deposited in this basin and are known as the Karroo System. Today these sediments still occupy nearly the whole of the Highveld, the Orange Free State and the Northern Cape Province. In the Loskop Dam area, however, they have been removed by erosion and the sediments of the Loskop and Waterberg Systems are once more exposed. The resistant Rooiberg felsite and Waterberg sandstone have caused the formation of mountains while the softer Loskop sediments occupy the valleys.

The evidence for the geological history as outlined above is to be found in the rocks themselves. By studying the nature of the rocks, their textures and structures and their relationship to one another their past is gradually unravelled (Fig. 1).

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* See geological map at the back of this booklet.

DESCRIPTION OF THE ROCK TYPES

The hill just north of the dam consists mainly of granitic volcanic rock known as *Rooiberg felsite*. It is usually a dense, brick-red rock often showing a banded structure. Black and grey varieties are also found. The banding represents the flow structure in the original lava and is caused either by layers of gas-bubble holes (vesicles) or by layers of minerals such as hornblende (black), epidote and chlorite (green) or calcite (white). The banding, which must have been horizontal when the rocks were formed, now dips at an angle of about 60° to the south, indicating considerable tilting by earth movements. In the vicinity of the dam wall the strike is more or less east-west but further to the west, in the Elandsberg, the strike of the rocks swings towards the south-west. Interbedded with the felsite are thin layers of white, gray or purple volcanic ash known as tuff, toegther with lenses of volcanic fragments known as agglomerate. The tuff is soft and often well bedded so that it may resemble mudstone or shale. The agglomerate is composed of angular fragments of lava cemented together with volcanic ash. On a weathered surface it displays a very characteristic pitted appearance (Fig. 2). Interbedded with the volcanic rocks are also brown, grey and white sandstone, quartzite (hard sandstone) and shale. This would indicate that for at least short periods the volcanicity must have been interrupted by quiet sedimentation. The sediments are often well jointed, softer and more porous than the felsite and moisture is probably more abundant in them. In consequence plant roots can penetrate them more readily and vegetation is often much denser along these sediments than on the adjoining felsite.

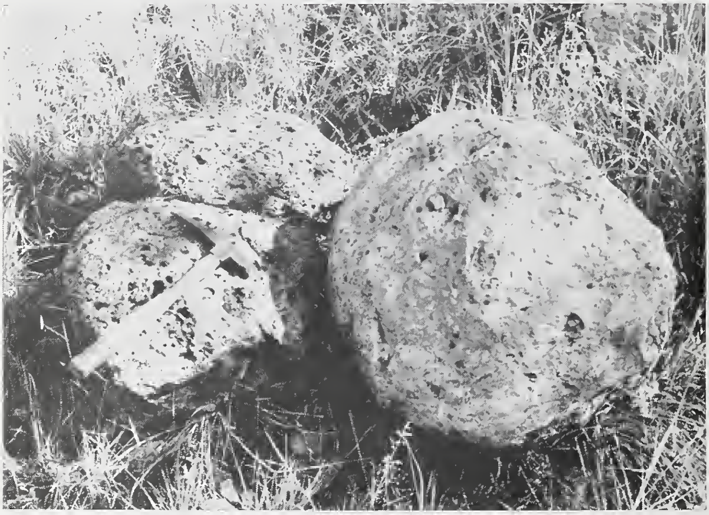

FIG. 2.—Boulders of Rooiberg volcanic agglomerate with characteristic pitted surface.

The best exposures of felsite, tuff and sediments are to be found in the large quarry along the road from which most of the rock for the concrete of the dam wall was obtained.

The 3,500 feet of sediments which were deposited during the first major period of sedimentation in post-Bushveld times constitute the *Loskop System*. In the eastern part of the area they follow more or less conformably on the Rooiberg felsite, i.e., they dip at approximately the same angle to the south. In the western and south-western portion of the Reserve the dip of the beds flattens with a corresponding increase in the width of the outcrop. Further south on the farm Hondekraal 114 (outside the present area) the sediments of the Loskop System are contorted and tilted to a vertical position. The rocks comprising the System are mainly soft felspathic sandstone, interbedded shale, and an impersistant band of conglomerate at the bottom of the sequence.

The pebbles of the conglomerate are usually about 3 or 4 inches in diameter, but may be as large as 8 inches. They are composed mainly of Rooiberg felsite although pebbles of white quartzite are not uncommon. The latter were probably derived from the Pretoria Series of the ancient Transvaal System which exists a few miles north of the dam. The best exposures of this conglomerate can be found along the northern banks of the Krantzspruit on the farm Zeekoegat 89 east of the Reserve. Further examples also exist along the foot of the Elandsberg and along the Langkloof to the south-west of the Reserve.

The sandstone is fine grained and has a purplish colour in the eastern sector of the area, as can be seen near the bridge across the Krantz Spruit on the farm Rietvallei 92. It is here also strongly crossbedded, a feature which can be used to determine the direction of the original current which deposited the sand. In the western part of the area the sandstone is usually white but it may be grey, purple or reddish-brown depending on the amount of cementing iron oxide. The sandstone is well exposed on the Blesbokvlakte and south-west of the Krokodildraai. The iron oxide is often concentrated in nodules which may have hollow centres and are known as "snuff-box" structures (Fig. 3).

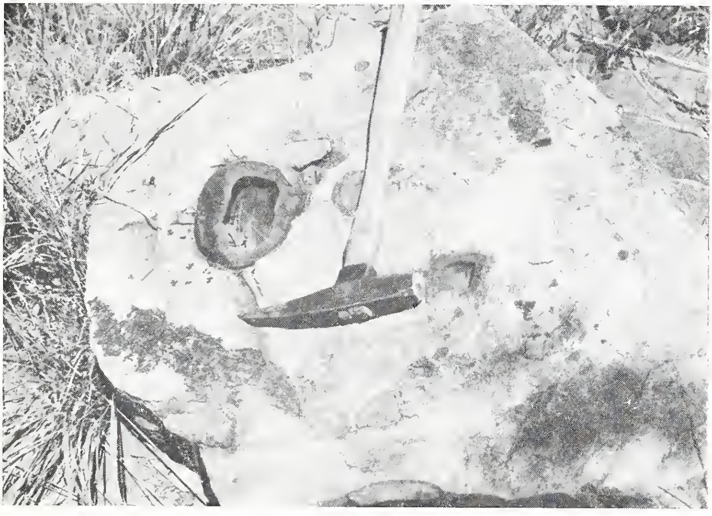

Fig. 3.—Loskop sandstone with a typical "snuff box" structure.

The shales of this system are purple and greenish in colour but seldom crop out on the surface. Examples can occasionally be seen in tributaries of the Krantz Spruit.

Most of the rocks of the Loskop System are soft and are easily eroded. In consequence they form the valleys both of the Krantz Spruit and the Olifants River. Outcrops are poor because of the thick covering of alluvium along the valley floors.

During the second major period of sedimentation large amounts of sand and pebble layers were deposited on top of the rocks of the Loskop System. These younger sediments constitute the *Waterberg System*. In the eastern portion of the area these rocks follow conformably on those of the Loskop System but in the west and south-west the unconformity becomes more marked as one goes south.

At the bottom of the sequence an impersistent conglomerate, marks the boundary between the Loskop and Waterberg Systems. The pebbles of this conglomerate are, on the whole, larger than those of the Loskop System and consist mainly of white and grey quartzite but some are of red felsite. The pebbles are cemented together by a ferruginous sandy matrix. The best exposures of the basal conglomerate are to be found along the foot of the mountain east of Scheepersloop and near the " Ou Werf " ("Old Homestead") (Fig. 4). Higher up in the succession are to be found several lenticular bands of conglomerate, as for instance near the trigonometrical beacon on Hartebeestplaat 189.

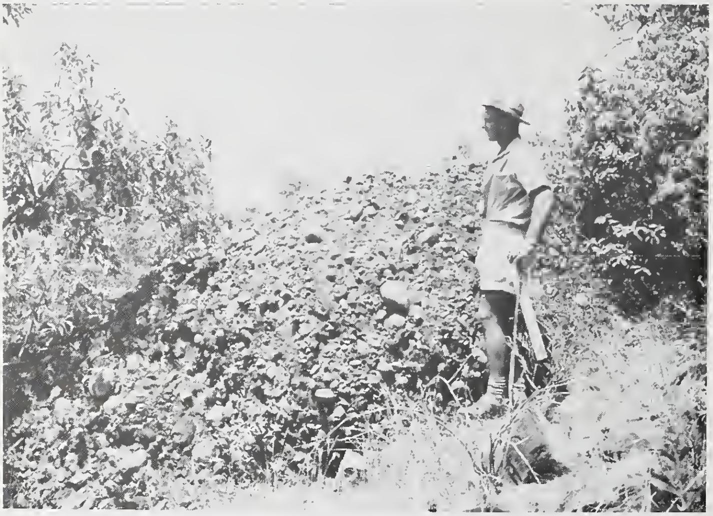

FIG. 4.—Waterberg basal conglomerate as exposed near the " Ou Werf ".

Local development of small-pebble conglomerate is also very common. The pebbles may be vein quartz, quartzite, felsite, chert or jasper and usually measure about ½ inch across.

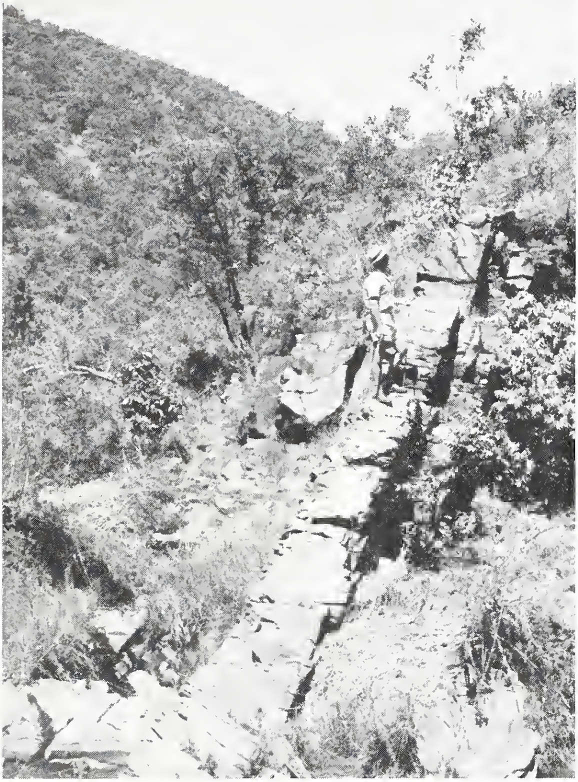

Fig. 5.—A band of hard resistant quartzite interbedded in Waterberg sandstone to be seen in Scheepersloop.

The rock types forming the bulk of the Waterberg System are poorly sorted, coarse-grained, reddish and purplish sandstone and quartzite. The cementing material is usually ferruginous but may be siliceous. In the latter case the beds may form hard bands which are resistant to weathering (Fig. 5). Ripple marks (Fig. 6) and crossbedding (Fig. 7) are two common structures found in the sandstones. The sediments dip towards the south at angles which vary from about 60° in the east to as low as 12° in the west. The best exposures lie along the main road to Middelburg (outside the reserve) in Scheepersloop (Fig. 8), south of the " Ou Werf " in Blesman se Loop and are probably most spectacular in the " Hell Gorge ", situated just outside the southern limit of the reserve.

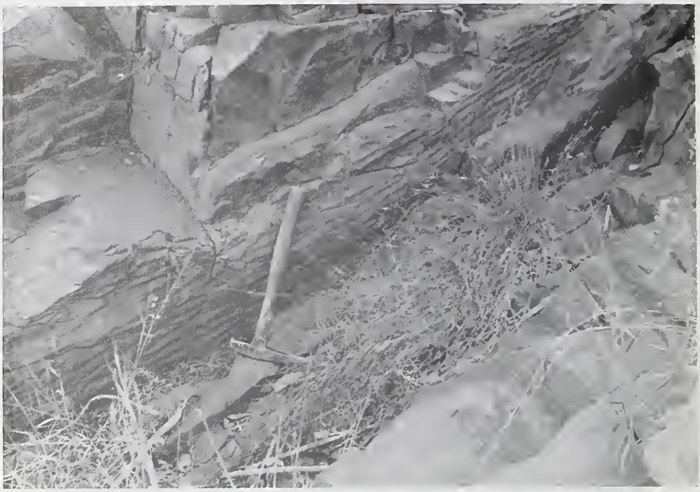

Fig. 6.—Waterberg sandstone with casts of ripplemarks in Scheepersloop.

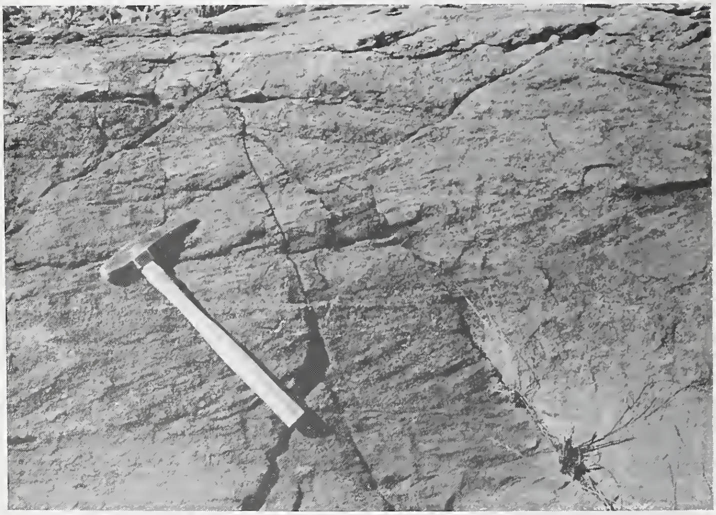

Fig. 7.—Typical development of crossbedding in coarse-grained Waterberg sandstone.

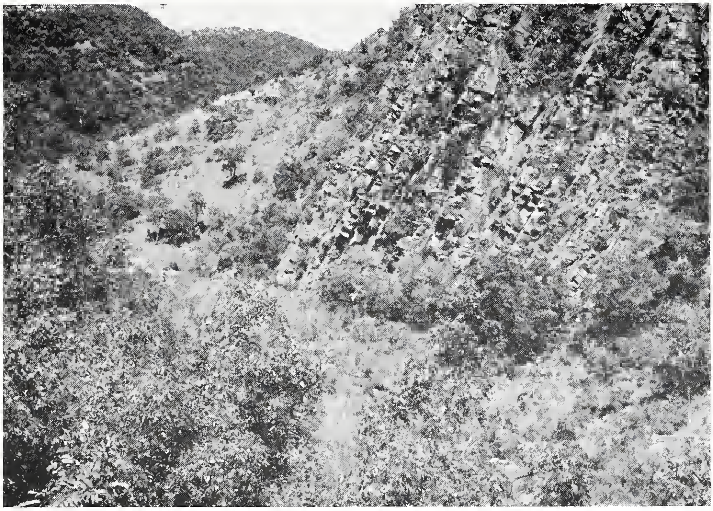

Fig. 8.—Steeply south-dipping sandstone of the Waterberg System in Scheepersloop.

Thin impersistent bands of purple and grey shale are developed locally in the sandstones. These shales may grade into the sandstone and because of their soft nature have led to the formation of valleys. Although seldom well exposed, examples may be found in some of the tributaries of Scheepersloop.

On the farm Polfontein 272 (outside the reserve) volcanic activity caused a disturbance of the Waterberg beds. Volcanic breccia and tuff can be found interbedded with the sandstones. A small amount of copper mineralization in the form of a green staining along joint planes can sometimes be found in the sandstones in this area.

INTRUSIVE ROCKS

After the Rooiberg felsitic lava had been poured out, but before the deposition of the sediments of the Loskop System there occurred intrusions of granite porphyry. This rock, which is brick-red in colour, is composed of phenocrysts of quartz and pink orthoclase with lesser amounts of altered, dark green biotite, set in a dense matrix. The rock is exposed on the farms Ringer 241 and Zeekoegat 89 and also forms the island, Carree's Kop and the Swartberg inside the reserve. A fault which runs along the edge of Lombard's Bay has brought about duplication of the outcrop.

In post-Waterberg times, and possibly as late as the Karroo period, basic dykes and sills were intruded into the older rocks. A dolerite sill occurs within the Waterberg sediments on the farms Bankplaats 47, Waterval 340 and Voetpadskloof 187, south of the reserve. The dolerite is typically blue-grey in colour on a fresh surface and weathers into characteristic spheroidal boulders. A thin weathered sill can also be seen in a road cutting on the farm Zeekoegat 89.

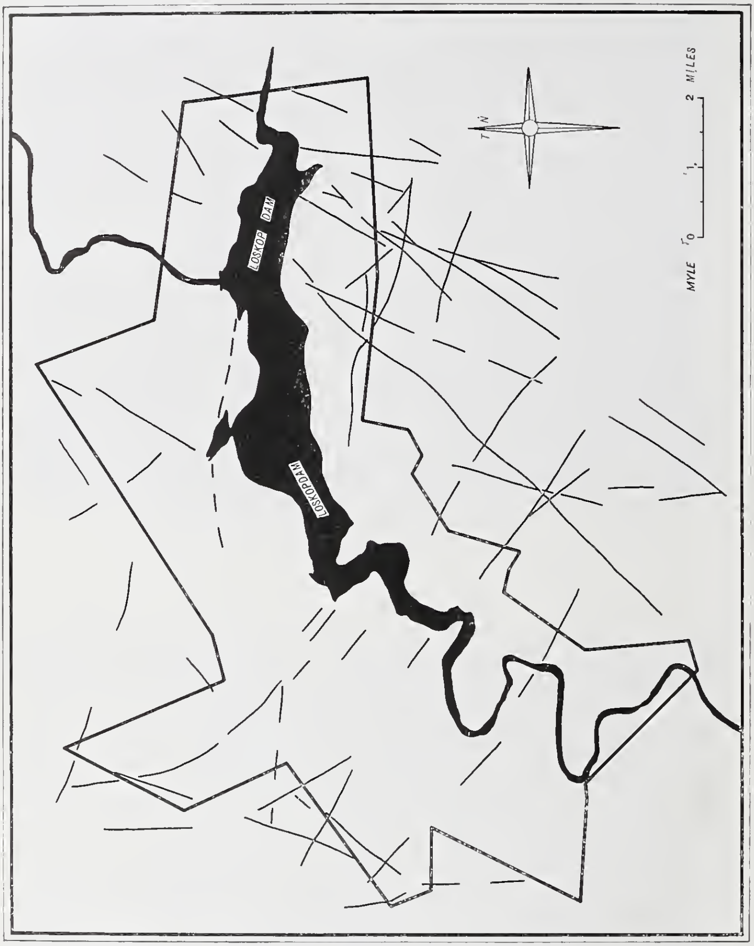

FIG. 9.—The joint pattern in the Loskop Dam area.

Inside the reserve dolerite occurs as a dyke cutting through felsite and Loskop sediments. The best exposures are to be found north of the Krokodildraai and west of the Swartberg.

JOINT PATTERN

A very prominent joint pattern exists in the area (Fig. 9). The joints strike mainly in two directions NE–SW and WNW–ESE. The Waterberg sediments are less resistant than the rocks of the Rooiberg formation with the result that the joints are more conspicuous in the former. The larger joints form depressions which extend in straight lines for several miles; streams often follow these depressions. In other cases the joints are marked by lines of denser vegetation (Fig. 10).

Note.—The rocks of which the foundations and verandas of many of the huts in the rest camp have been built, do not come from this area but have been obtained from the excavation of the irrigation canals further to the north. They consist of gabbro, anorthosite and mottled anorthosite belonging to the Bushveld Complex.

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Wolhuter, L. E. 1954. The geology of the Country Surrounding Loskop Dam, Transvaal (M.Sc.-thesis, University of Pretoria).

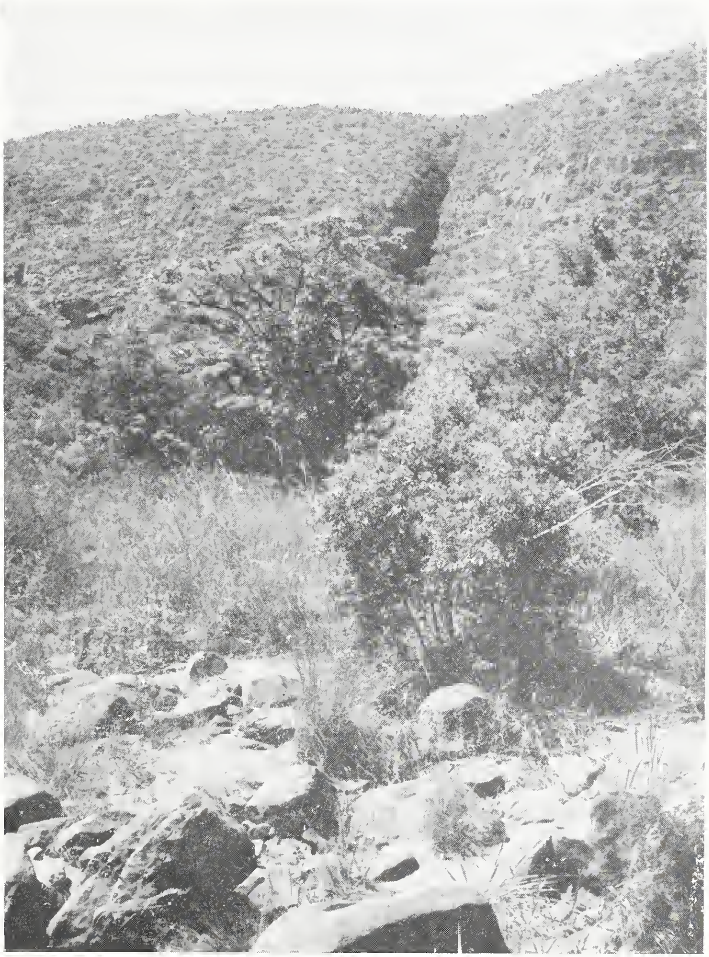
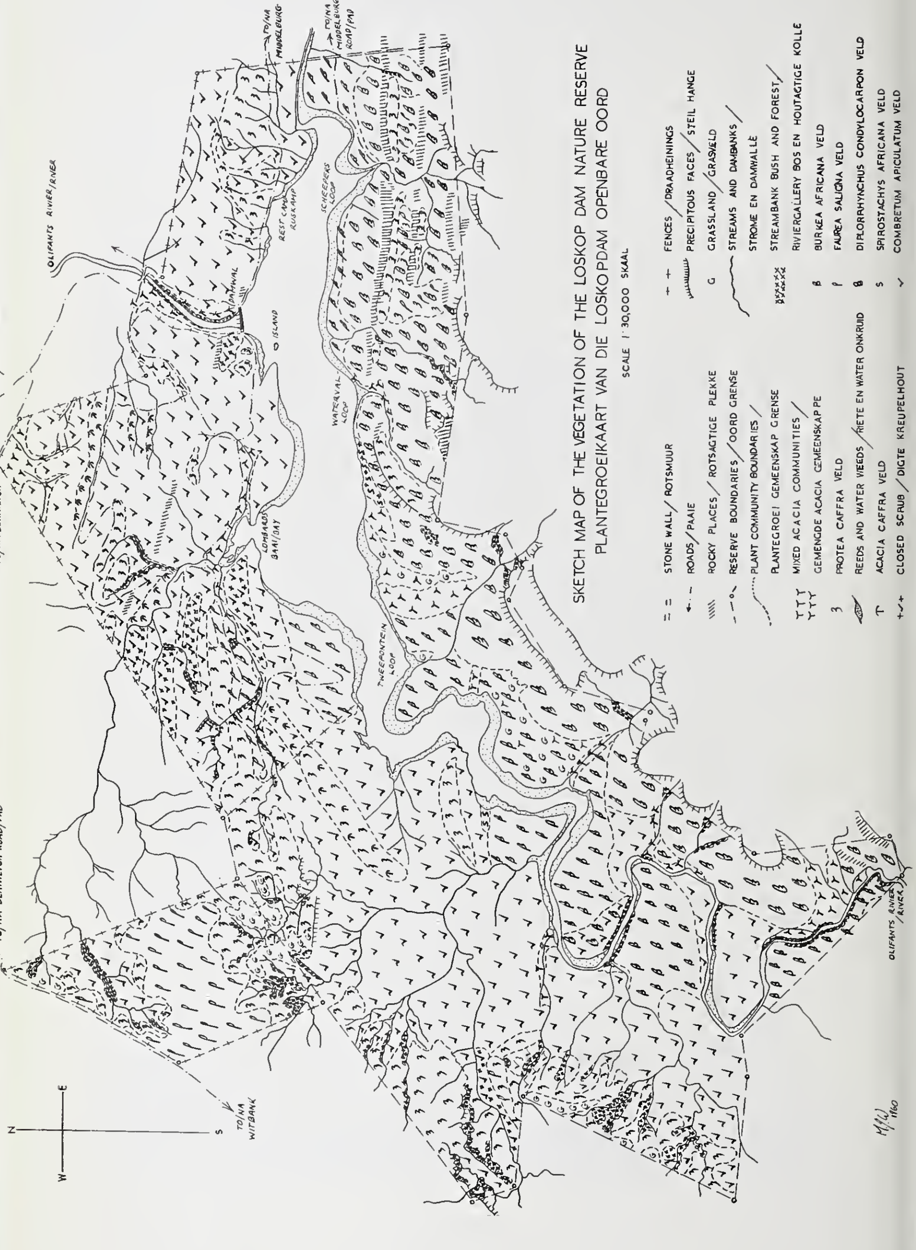


Fig. 10.—A depression formed along a large joint in the upper end of Scheepersloop.



SKETCH MAP OF THE VEGETATION OF THE LOSKOP DAM NATURE RESERVE
PLANTEGROEIKAART VAN DIE LOSKOPDAM OPENBARE OORD

SCALE 1 : 30,000 SKAAL

STONE WALL / ROTSMUUR
ROADS / PAAIE
ROCKY PLACES / ROTSAGTIGE PLEKKE
RESERVE BOUNDARIES / OORD GRENSE
PLANT COMMUNITY BOUNDARIES / PLANTEGROEI GEMEENSKAP GRENSE
MIXED ACACIA COMMUNITIES / GEMENGDE ACACIA GEMEENSKAPPE
3 PROTEA CAFFRA VELD
REEDS AND WATER WEEDS / RIETE EN WATER ONKRUID
ACACIA CAFFRA VELD
CLOSED SCRUB / DIGTE KREUPELHOUT
FENCES / DRAADHEININGS
PRECIPITOUS FACES / STEIL HANGE
G GRASSLAND / GRASVELD
STREAMS AND DAMBANKS / STROME EN DAMWALLE
STREAMBANK BUSH AND FOREST / RIVIERGALLERY BOS EN HOUTAGTIGE KOLLE
BURKEA AFRICANA VELD
FAUREA SALIGNA VELD
DIPLORRHYNCHUS CONDYLOCARPON VELD
S SPIROSTACHYS AFRICANA VELD
COMBRETUM APICULATUM VELD
TO/NA DENNILTON ROAD/PAD
TO/NA DENNILTON
TO/NA GROBLERSDAL
OLIFANTS RIVIER/RIVER
TO/NA MIDDELBURG
TO/NA MIDDELBURG ROAD/PAD
REST CAMP RUSKAMP
SCHEEPERS LOOP
DAMWAL
ISLAND
WATERVAL LOOP
LOMBARDS BAAI/BAY
TWEEFONTEIN LOOP
OLIFANTS RIVIER/RIVER
TO/NA WITBANK
N
S
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THE CLIMATE AND VEGETATION OF THE LOSKOP DAM NATURE RESERVE

By M. J. Wells,

National Herbarium, Pretoria

CLIMATIC EFFECTS

OFTEN, the first question a visitor asks himself as he enters the valley of the Olifants River, is " Why are there suddenly so many trees, when the plain we have just left is bare of woody vegetation?" The answer lies in the steep, well-drained slopes; the shelter which rocks afford to tree seedlings which are susceptible to drought and fire; and the shelter which the valley gives from cold and desiccating winds and the searing effects of wind-driven fires.

The Loskop area, which lies in the rain shadow of the Lebombo Mountains, receives a mean annual rainfall of between 25 and 30 inches. However, the valley of the Olifants River provides its own smaller rain shadow, in which the mean annual rainfall is between 20 and 25 inches. A result of this relatively low rainfall is that few moisture-loving shrubs and herbs grow in the shade of the trees, whose roots utilise most of the available soil water.

Much of the rain occurs in falls of less than 1 mm. and in order to utilise this rain and light dew falls, many of the tree roots are very near the soil surface, in direct competition with one another and with grass roots. Thus, the grass tufts are often quite far apart and the trees do not grow in clumps, except along stream and dam banks and where water collects at the edges of rock outcrops.

The rainfall is most unreliable, an example being that as much rain (18 ins.) fell during one month (January, 1915) as fell during the entire following year. The only long-lived plants are those which can withstand the driest conditions. Many of these plants have long tap roots, which reach down to deep-seated water. An example of this kind of plant is the sweet thorn (*Acacia karroo*) which often grows new leaves in spring, before the season's first rains. Other long-lived plants, many of them members of the families *Liliaceae* and *Iridaceae*, store water in fleshy underground parts—the winter food of bushpig and baboon.

Nearly 77 per cent of the rain usually falls during the six summer months and less than 4 per cent usually falls during the three mid-winter months, and although the humidity is most frequently between 79 per cent and 47 per cent, it sometimes drops below 30 per cent in winter. Thus, it is not surprising that most of the woody plants shed their leaves and most of the herbs die back to ground level during winter. This winter resting period limits the carrying capacity of the reserve and it is only natural that animals, which are dependent on the vegetation, should die during the more severe winters.

Yet, in the valley, the dry grass remains palatable to grazing game during winter, an important fact, since many of the seasonal migrations of game are closely connected with the distribution of life-giving food and water. However, a small reserve like Loskop cannot hope to recreate the natural conditions under which great herds of wildebeeste or elephant might decimate the vegetation and move on.

The heaviest rain falls during summer storms, when much water is lost by run-off, and when most soil erosion takes place. However, the vegetation cover in the Loskop Reserve, which has been protected from clearing and overstocking since 1940, is now sufficient to prevent serious soil erosion.

Heat accumulates in the dense valley atmosphere, with the result that shade temperatures of over 30° C (86° F) occur during all months—the highest temperature recorded being 41·1° C (106° F). Thus, it is not surprising that most of the plants present have tropical distributions, or else are closely related to families of tropical origin. A notable exception is the Transvaal sugar bush (*Protea caffra*), which is an offshoot of the temperate flora so characteristic of the South-West Cape.

During winter, cool air drains down the Olifants River Valley past the Loskop Dam weather station, which experiences only one or two light frosts each year. and accumulates on the irrigated flats which experience frosts during three months of the year, an absolute minimum temperature of—5·8° C (22·4° F) having been recorded. Thus, frost-sensitive species, such as the common candelabra *Euphorbia* (*E. ingens*), which are absent from the Middelburg and Loskop Canals areas are present in the reserve.

THE VEGETATION

Most obvious effects of past farming activities have now been covered over by regenerating plant communities, though the *Jacaranda* trees about the old homestead on the southern shore of the dam, are still visible from the rest camp. However it would be wrong to presume that natural climax vegetation is now established, since we have little knowledge of the extent to which veld burning as practised by the Bantu, Bushmen and their stone and bone age predecessors over a period of many thousands of years, may have affected the present vegetation.

Many changes in the vegetation may yet take place as a result of the grazing, browsing, trampling and seed dispersal effects of the animals which have been re-introduced to the reserve. Of these, it is worth noting that zebra, wildebeest, sable and reedbuck are mainly grazers, whilst kudu, bushbuck and nyala are mainly browsers and most other game animals, such as impala, duiker and blesbuck, graze and browse on occasion. In future it may well become necessary to control artificially the grass-scrub relationship in order to provide sufficient cover for all sections of the animal population; whilst in the absence of lion and other predators, the numbers of some antelope may have to be controlled in order to preserve the vegetation. Thus, neither the animal nor the plant community will attain its climax at the expense of the other.

In most places the vegetation changes are slow, but near the dam, where the water table has been raised, a relatively rapid upgrowth of the " ghost tree " (*Terminalia sericea*) and the tamboti (*Spirostachys africana*) is progressing, and in the forseeable future most of the dam will be fringed by closed woodland.

The present distribution of plant communities is shown on the map. These communities are distinguished mainly by the local preponderance of trees such as the kaffir-thorn (*Acacia caffra*), the Transvaal sugar-bush (*Protea caffra*), the wild seringa (*Burkea africana*), the common beechwood (*Faurea saligna*) and the red bush willow (*Combretum apiculatum*). However, some species such as the kaffir-thorn, occur in almost all the communities which are but variations of a single veld type, the Mixed Bushveld.* This veld type ranges in structure from open savanna on the deep soils of the plateau top and broad valley floor, to closed scrub on steep northerly slopes, with woodland fringing the streams, and small forest patches in the kloofs.

Within the Loskop climatic region, geology would appear to be the strongest single factor influencing community distribution, whereas in the higher rainfall areas of Natal where soils are generally deeper, community distribution conforms closest to topographic aspects: marked differences being present between north and south facing slopes. Similar differences are present between north and south facing slopes in the Loskop area, but the key to these differences lies not so much in climate as in the presence of roughly parallel outcrops of hard rock, tilted so that the strike faces, with many deep crevices, are exposed on the northern slopes of the hills (Fig. 1).

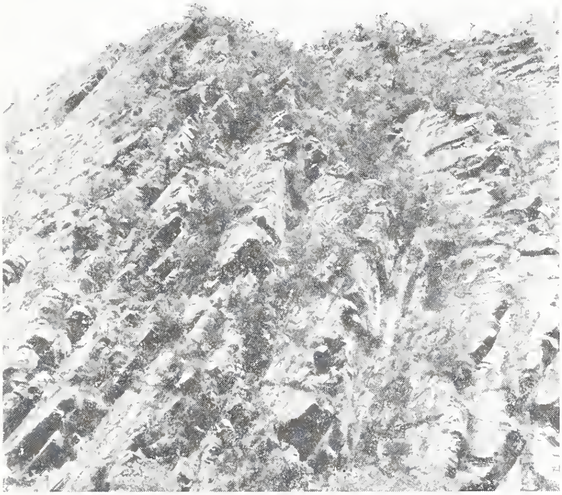

FIG. 1.—A tilted strike face in Scheepersloop.

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* The distribution and constitution of this veld type is detailed by Mr. Acocks in his " Veld Types of South Africa," obtainable from the Government Printer, Pretoria.

These outcrops support their own peculiar flora of wiry grasses and succulents, such as Aloes and Euphorbias, of which the most striking is the lesser candelabra *Euphorbia* (*E. cooperi*). Some of the best wild fruit trees, including the " stem-fruit " (*Pouteria magalismontana*)*, the kaffir plum (*Ximenia caffra*) and the wild figs (*Ficus* species) are also to be found on the krantzes (Fig. 2).

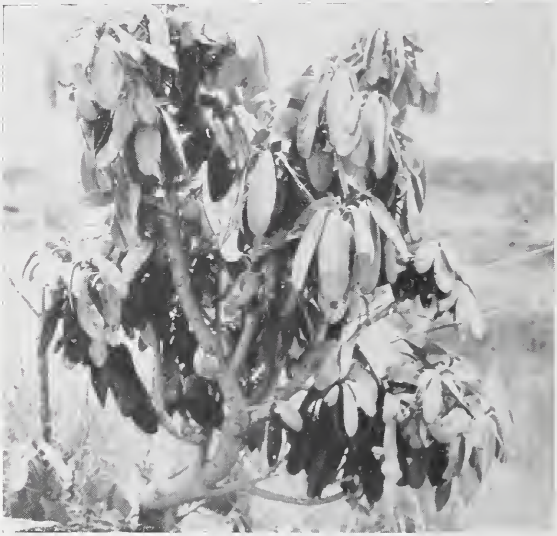

FIG. 2.—*Pouteria magaliesmontanum.*

Water stored in rock crevices and between loose rocks, is available to plants with penetrative root systems, even though the rock formation is hidden beneath a mantle of soil. Thus, a closed scrub is often present on the north faces of hills (Fig. 3). The individual plants in this scrub are in close competition with one another, and seldom exceed 15 feet in height, except where an exceptionally large crevice is present.

North of the dam, where Rooiberg felsite outcrops, the red bush willow (*Combretum apiculatum*) is dominant in this scrub. South of the dam, where Waterberg sandstone outcrops, the " horn pod tree " (*Diplorrhynchus condylocarpon*) is dominant, especially on the lower slopes.

On the south faces of the hills, trees are often stunted and far apart, since their roots cannot penetrate the parallel layers of hard rock to the moist soil filled crevices beneath. Where only a skin of soil covers the hard rock, the " blue pea-tree " (*Mundulea sericea*) is often locally dominant (Fig. 4).

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* Better known under its old name: *Chrysophyllum magaliesmontanum.*

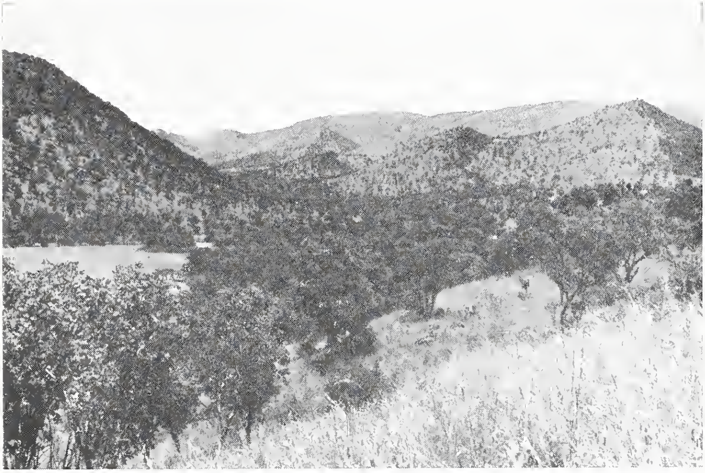

FIG. 3.—Hills west of Lombard's Bay.

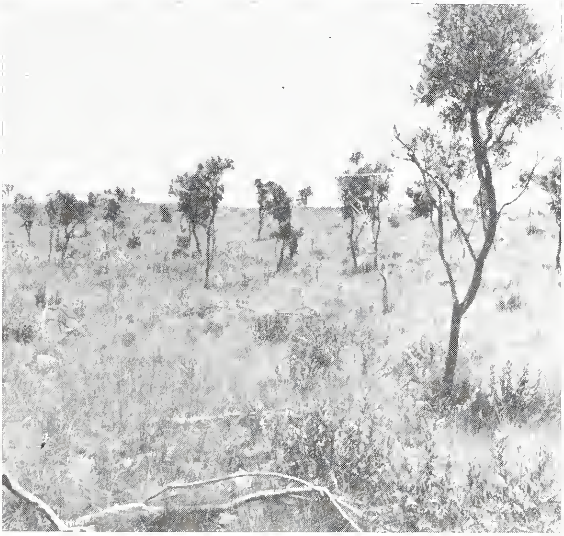

FIG. 4.—*Mundulea sericea.*

Where soft shale overlies the hard rock, usually on south-facing slopes, the Transvaal sugar-bush (*Protea caffra*), and the kaffir-thorn (*Acacia caffra*) are dominant. The kaffir-thorn may be distinguished from the other Acacias by its feathery, drooping, greyish-green leaves, small recurved spines, spikes of creamy flowers, brownish pendulous pods in persistent clusters and a gnarled trunk with a rough, brown bark. The common beechwood (*Faurea saligna*) is locally dominant at the foot of south-facing slopes, but also occurs occasionally on the hottest valley flats (Fig. 5). However, *Faurea* communities are best developed on the sandy uplands, approached by the Witbank road. This tree, which is a member of the *Protea* family, has slender pendulous leaves, and a rough black bark, from which tannin can be extracted commercially. The plants common name derives from a superficial resemblance of its wood to that of the European beech (*Fagus sylvatica*).

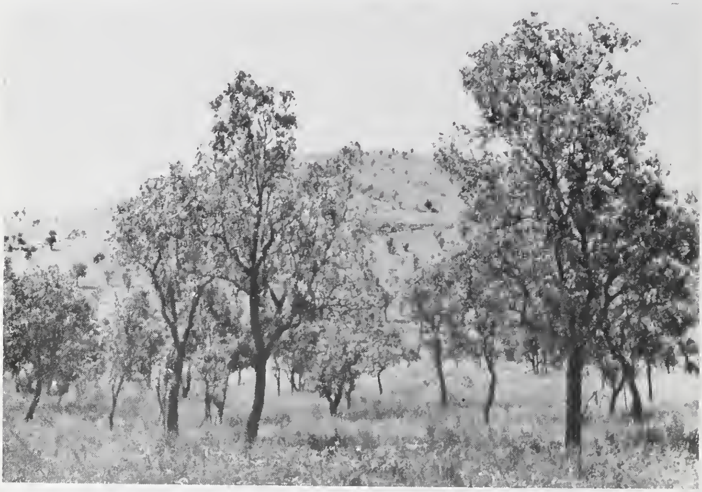

Fig. 5.—*Faurea saligna.*

The wild syringa (*Burkea africana*) is usually dominant on the deep soiled, gently sloping foothills near the dam (Fig. 6). This tree, whose wood has been used in making furniture, wagons and parquet flooring, is easily recognised by the reddish-brown fur on its buds. Also locally common on the valley flats are the " sour kaffir orange " (*Strychnos cocculoides*) with its tart, refreshing fruit; the 35 foot tall, black monkey-thorn (*Acacia burkei*); the conspicuous " ghost tree " (*Terminalia sericea*), whose silver leaves shade clusters of its pink, two-winged fruit; and the false marula (*Lannea discolor*), whose smaller fruit and rounder leaflets distinguish it from its close relative, the marula (*Sclerocarya caffra*).

Most of the twelve *Acacia* species recorded from the Loskop area occur in mixed *Acacia* communities of the hot valley floors, where the presence of a relatively high water-table mitigates the effects of evaporation. The sweet thorn (*Acacia karroo*), which may be recognised by its round,

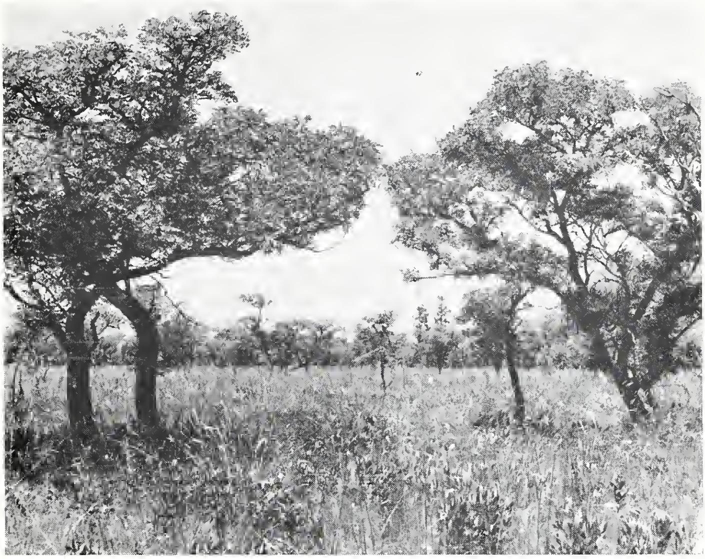

FIG. 6.—*Burkea africana.*

yellow flower heads, sickle shaped pods and sticky young twigs, is usually dominant. This species usually has a thick trunk and a dense, rounded crown; but in some places probably as a result of certain soil factors, the plants remain spindly shrubs (Fig. 7). One such place is near the gate of the game reserve, where the knob thorn (*Acacia nigrescens*) and the gum arabic thorn (*Acacia nilotica* sub-species *kranssiana*)*, also occur (Fig. 8). Other Acacias which occur in the reserve are the red bark thorn (*Acacia gerrardii*), the camel thorn (*Acacia giraffae*), the flake bark thorn (*Acacia sieberiana* var. *woodii*)† and the umbrella thorn (*Acacia tortilis* sub-species *heteracantha*),‡ also known as the "hook and spike", since it has both types of thorn.§

Other bushveld trees of particular interest are Zeyher's bush willow (*Combretum zeyheri*) with its 2½-inch long winged fruits and the leadwood or hard-coal bush willow (*Combretum imberbe*) which, in South West Africa, is known as the "mensboom" since the Hereros believe it to have been their ultimate ancestor. The distinctive, round crowned cabbage trees (*Cussonia spicata* and *Cussonia paniculata*), are also common as is the wild lavendar tree (*Heteropyxis natalensis*), whose leaves have only to be crushed to emit a pungent odour (Fig. 9). An attractive relative of the cultivated Crotons with their varicoloured leaves, is *Croton gratissimus*, whose own leaves with their rust-spotted silver undersurfaces, are most decorative amongst the mountain scrub.

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* Better known under its old name: *Acacia arabica* var. *kraussiana.*

† Better known under its old name: *Acacia woodii.*

‡ Better known under its old name: *Acacia heteracantha.*

§ Many of the Acacias have been figured in Dr. L. E. Codd's book on the "Trees and Shrubs of the Kruger National Park", obtainable from the Government Printer, Pretoria.

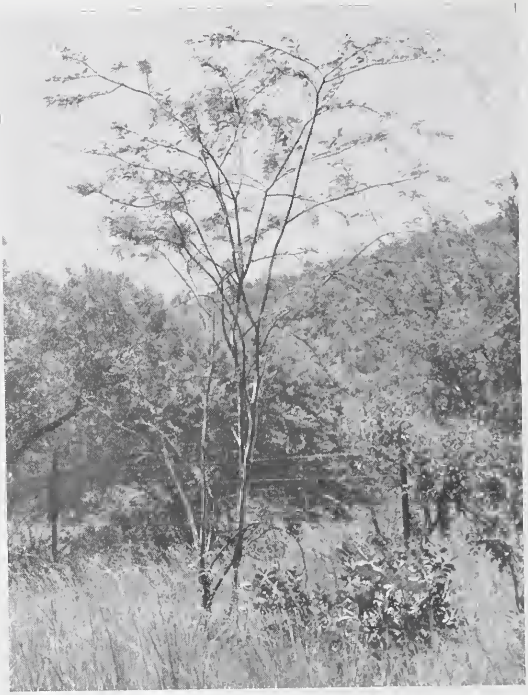

FIG. 7.—Acacia karroo.

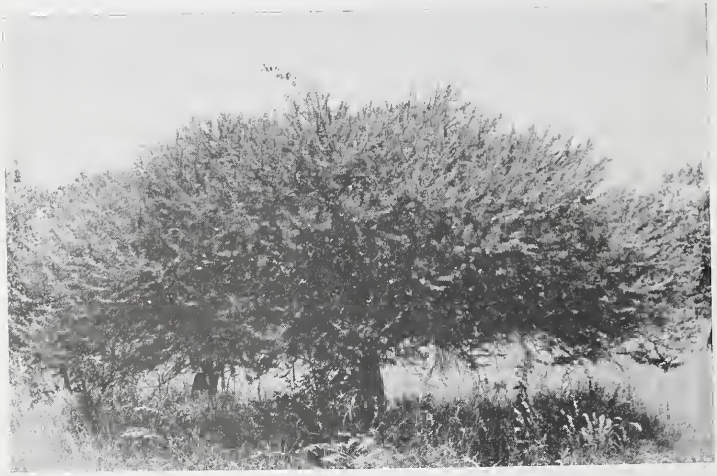

FIG. 8.—*Acacia nilotica* ssp. *kraussiana*.

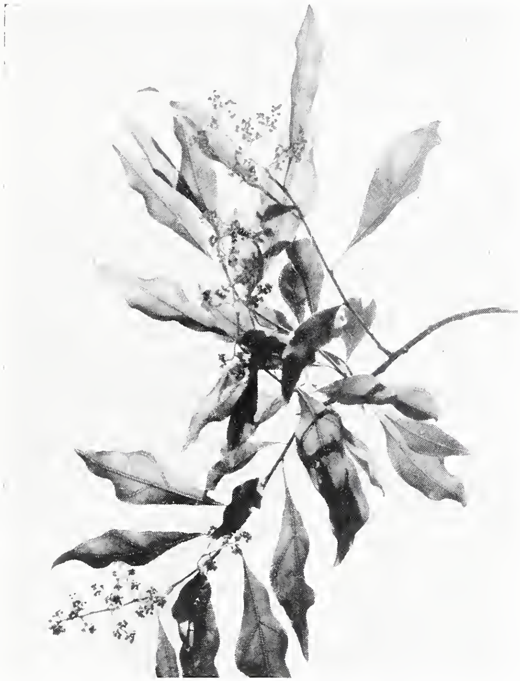

FIG. 9.—*Heteropyxis natalensis.*

The paper bark trees (*Commiphora neglecta* and *Commiphora marlothii*) with thin, reddish flakes peeling from their sickly pallid-green, smooth trunks, often excite feelings of revulsion, and have even been called " fever trees ", though otherwise quite unlike the true " fever tree " (*Acacia xanthophloea*) of the lowveld.

This account is too short to do more than mention some of the commoner bushveld trees such as the oil seed tree (*Pappea capensis*), the graceful mountain karee (*Rhus amerina*), the wild olive (*Olea africana*), the brilliantly flowered tree fuchsias (*Schotia brachypetala* and *Schotia transvaalensis*), the round-leaf kiaat (*Pterocarpus rotundifolia*) with its attractive yellow pea-flowers and the red ivory (*Phyllogeiton zeyheri*)† with its beautiful fine-grained wood and small, succulent berries.

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† Better known under its old name: *Rhamnus zeyheri.*

Although uncommon in the reserve, the cone-bearing tree Cycads (*Encephalartos eugene-maraisii* and *Encephalartos lanatus*) are of considerable local interest (Fig. 10). These plants belong to an ancient order, once dominating the hot, swampy forests which today yield the coal of Witbank and other relatively dry places. Contrary to popular belief, the individual *Cycads* are probably no older than many of the flowering trees, among which they grow.

Of the shrubs, the eland's bean (*Elephantorrhiza burkei*) with its finely subdivided leaves is exceptionally common, providing almost as much cover as the trees on some of the north-facing slopes. Also important are the common wild currant (*Grewia flava*) and the " pen-thorn " (*Maytenus cymosa*)* whose grey-green leaves and dense clusters of small cream flowers are produced on branches abbreviated into spines. The white berry bush (*Fluggea virosa*) and the stingless nettle or wild soap bush (*Pouzolzia hypoleuca*) which has a white felt underneath its leaves, are both common near the rest camp.

Other shrubs of interest are the kaffir bride (*Pavetta assimilis*) which is covered with a mass of sweet scented, greenish white flowers at Christmas time, and the resurrection plant of the dry krantzes (*Myrothamnus flabellifolia*) whose leaves, shrivelled under dry conditions, become turgid and

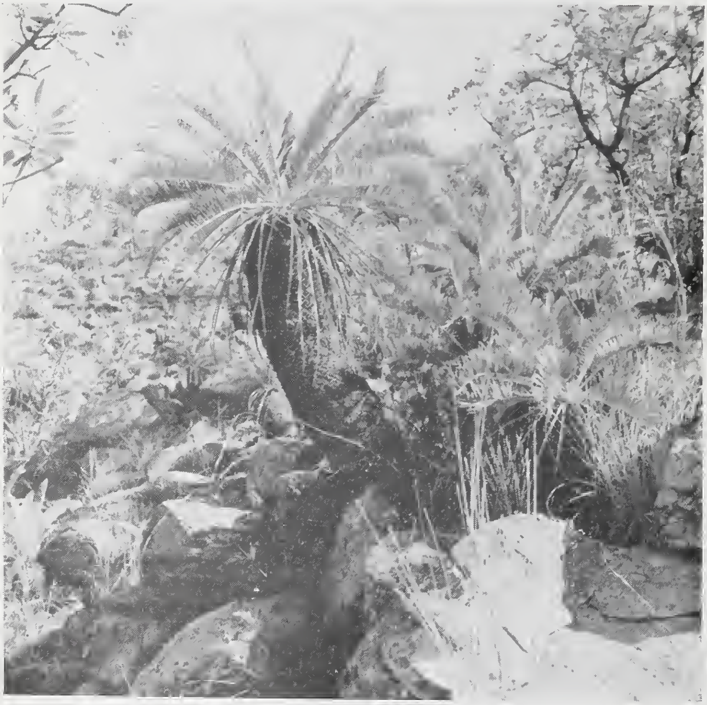

FIG. 10.—A tree cycad near Loskop.

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* Better known under its old name: *Gymnosporia buxifolia*.

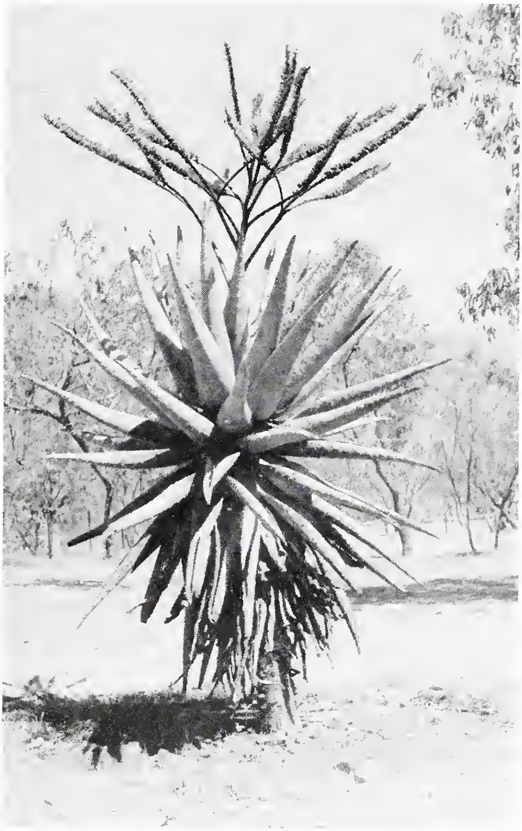

Fig. 11.—*Aloe marlothii.*

green within half an hour of rain or dew falling. One dried and poisoned herbarium specimen of this plant, over a hundred years old, still exhibited the mechanical ability to green up on being moistened—a reaction not indicative of life.

Aloes are among the characteristic growth forms of the bushveld which, together with the umbrella *Acacias* and candelabra *Euphorbias*, have been immortalised in the paintings of Pierneef. There are nine species of *Aloe* in the reserve ranging from *A. marlothii* which flowers in winter and sometimes attains a height of 18 feet, to *A. verecunda*, which flowers in summer and all but disappears in winter when its aerial parts dry up (Fig. 11). Other *Aloe* species* present include *A. pegleri*, *A. davyana*, *A. castanea*, *A. cryptopoda*, *A. longibracteata*, *A. mutabilis* and *A. pretoriensis*.

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* Identifiable from Dr. Reynold's book on the Aloes of South Africa.

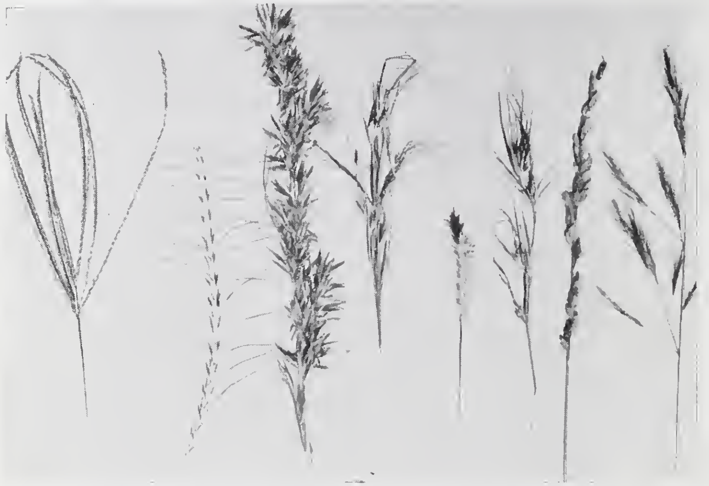

FIG. 12.—From left to right: *Digitaria smutsii* (Smuts fingergrass); *Urelytrum squarrosum* (centipede grass); *Cymbopogon excavatus* (turpentine grass); *Hyparrhenia dissoluta* (yellow thatching grass); *Elyonurus argenteus* (wire grass); *Themeda triandra* (red-grass); *Eragrostis superba* (flat-seed love grass); *Aristida barbicollis* (three awned grass).

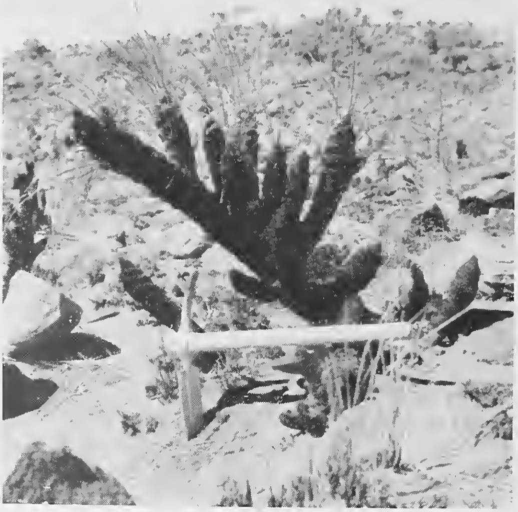

FIG. 13.—*Vellozia retinervis.*

A contrast with European tradition is highlighted by the popular name " Kalahari Christmas Tree " for the shrub *Dichrostachys cinerea**, which has a growth form the grotesque opposite of its graceful European counterpart. *Dichrostachys*' pink and yellow catkin-like flower heads have also earned it the name " Chinese lantern tree ".

Also associated with Christmas are the six different kinds of mistletoe which are present. Most decorative of these parasites is *Viscum combreticola* with its jointed and flattened, leafless green stems. Also prominent is *Loranthus rubromarginatus*, often known as " candles " because of its ranks of brilliant red, erect tubular flowers.

Bushveld climbers include many colourful plants such as the traveller's joy (*Clematis brachiata*) and the wild jasmine (*Jasminum multipartitum*), the commercial production of whose perfume is now being investigated by overseas fashion salons. Of far greater benefit to humanity, however, is the elephant's foot or tortoise plant (*Dioscorea sylvatica*) whose corms are one of the sources of diosgenin, a precursor of cortisone, used in the treatment of arthritis and other ailments. A few specimens of this plant are to be found on the slopes above the dam wall.

Among the poisonous plants, the baboon poison (*Adenia digitata*), the bushman arrow poison (*Acokanthera venenata*) and the cattle poison " gifblaar " (*Dichapetalum cymosum*), are comparatively rare in the reserve.

Grassland occurs both as a community in its own right and as an understory to the savanna trees. Though the trees are the more prominent, it is the grasses which lend to the South African veld its essential character of everlasting variety and interest, so valued by men like the late Field Marshal J. C. Smuts, whose name is linked with one of the most distinctive local species (Fig. 12).

Other grasses of importance in the area are the russet grass (*Loudetia simplex*) of rocky hillslopes, and the guinea grass (*Panicum maximum*) which grows in shade. Also in the shade are the blue and yellow flowered Commelinas, often known as " Wandering Jews ", and *Hibiscus calyphyllus*, whose large yellow flowers have deep maroon centres.

The most attractive grassland herbs are the white, wild carnation (*Dianthus mooiensis*) and the orange-red " Barberton daisy " (*Gerbera jamesonii*), which carpets shaded ground in parts of the Tweefontein reach. However, these plants are only prominent during their short, summer flowering periods, whereas the fibrous-stalked " besem-bush " (*Vellozia retinervis*), attracts attention at all seasons and the leaf fans of the pink lily (*Boöphone disticha*) are prominent all summer (Fig. 13, 14).

Other veld flowers include *Lasiosiphon kraussianus*, whose furry heads of sickly-sweet scented yellow flowers are prominent in spring: *Crinum bulbispermum*, the " river lily ", whose pink and white trumpet flowers often appear before the first spring rains; *Blepharis squarrosa*, a weird, spiny little plant with sky blue flowers; and the everlastings, including *Helichrysum cooperi*, which the natives use in preparing a love potion.

Most prominent of the root parasites are the blood red flowered witchweeds (*Striga species*) which are closely related to the cream, ink flower (*Harveya speciosa*) whose flowers turn black on wilting.

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* Better known under its old name: *Dichrostachys glomerata*.

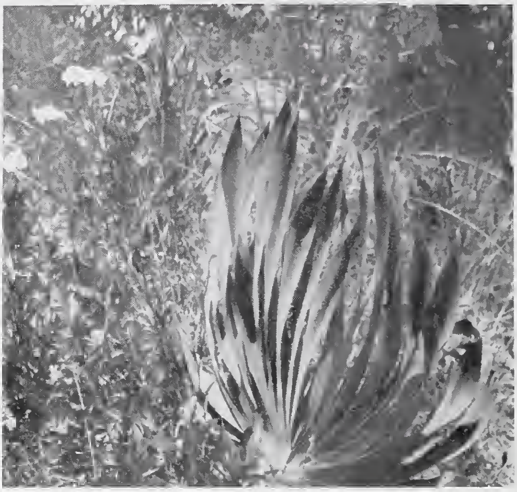


FIG. 14.—*Boöphone disticha* together with white flowers of *Dianthus mooiensis.*

As mentioned earlier, Streambank Woodland only persists on the upper reaches of the Olifants River and its tributaries, the lower reaches having been drowned by the dam. This attractive community often has a closed canopy 35 or more feet above the ground and is usually dominated by the " Vaderlands Wilger " (*Combretum erythrophyllum*) which, like the red bush willow, has four-winged fruit about $\frac{3}{4}$ of an inch long.

Other common trees in Streambank Woodland are the ghost tree (*Terminalia sericea*), the tamboti or african sandalwood (*Spirostachys africana*), the brittle thorn (*Acacia robusta*), the sweet thorn (*Acacia karroo*) and the shiny-leaf wait-a-bit thorn or buffalo thorn (*Zizyphus mucronata*) which has also been ruefully named " come and I'll kiss you ".

The tamboti is of special interest, since temperature-sensitive grubs in its fallen fruit together constitute the jumping beans which feature in so many tales of the bushveld. This tree is also the foodplant of the caterpillars of the green, long-tailed South African moon moth (*Argema mimosae*) which sometimes flies into camp lights at night.

The small patches of forest in the kloofs are usually extensions of Streambank Woodland and do not show as separate communities on the map. However, the forest trees sometimes attain a height of over 60 feet, and include species such as the kamdebo stinkwood (*Celtis africana*), so favoured as a shade tree in Pretoria, and the " quinine tree "(*Rauvolfia caffra*). This plant belongs to a group which has yielded many alkaloids, including reserpine, which is used in the treatment of hypertension. However, the tree is reported to contain no alkaloids of the cinchona group and decoctions of the bark cannot be depended on to relieve malaria.

The Cape chestnut (*Calodendrum capense*), which occurs occasionally in these forests, is prominent with its masses of pinkish flowers. At a distance small trees of this species may be confused with the " pink powder puff " or " pompom tree " (*Dais cotinifolius*), which does not occur naturally in the reserve, but which has been planted in the camp grounds. The two species have almost identical flower colour and flowering time, but the latter species has by far the smaller flowers, in compact heads. Unfortunately this attractive plant is fast disappearing from its natural habitats, since its fibrous bark is stripped for binding faggots.

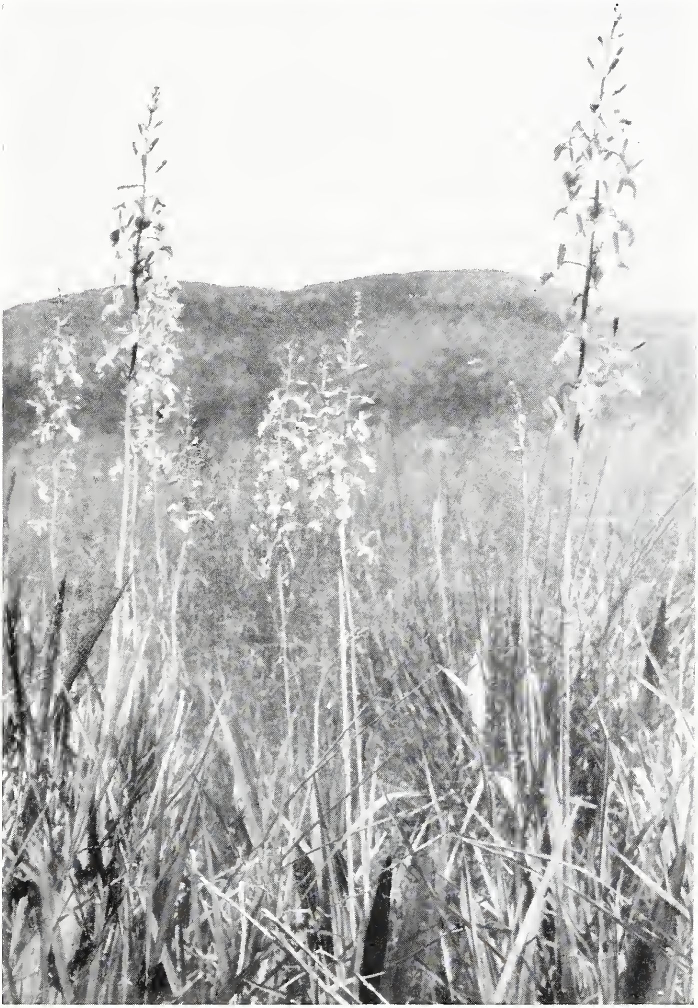


FIG. 15.—*Eulophia angolensis* .

The last community of importance is that of the water-plants, which fringe the streams and dam. Most prominent of these are the common reed (*Phragmites communis*) and the bulrush (*Typha australis*). Also of importance are the water weeds, which include the elbow grass (*Panicum glabrescens*) and the silver knot weed (*Polygonum senegalense* forma *albotomentosum*). Seeds of both these species germinate on exposed mud when the water-level in the dam drops. When the water-level rises again, the plants grow up and flower above water. The blue water-lily (*Nymphaea caerulea*) is very local in occurrence, but may be seen on a pool in Scheeper's Loop. Other attractive water-plants are the sedge-like *Xyris capensis* with its small yellow flowers, and the five foot tall. butter-yellow flowered orchid *Eulophia angolensis* (Fig. 15).

Although some of the vegetation may appear superficially to be rather uniform, a great variety of plants exist in the reserve to be discovered by the keen observer. Mr. A. O. D. Mogg who has been collecting at Loskop since 1933 and whose interest in preserving nature knows no bounds, has recorded the presence of over a thousand species of plants belonging to 117 different families, in the reserve.

Many of these plants are only prominent when in fruit or in flower and it is well worth while visiting the reserve at different seasons, even if only to see the *Aloes* in flower in winter; the " perdespook " or pink lily (*Boöphone disticha*), the lekkerbreek (*Ochna pulchra*) and the false pear (*Dombeya rotundifolia*) in flower in spring; the *Acacias*, *Proteas* and besem bush (*Vellozia retinervis*) in flower in summer, and the russet-tinted fruit of the bush willows (*Combretums*) and leaves of *Bridelia mollis* in autumn.

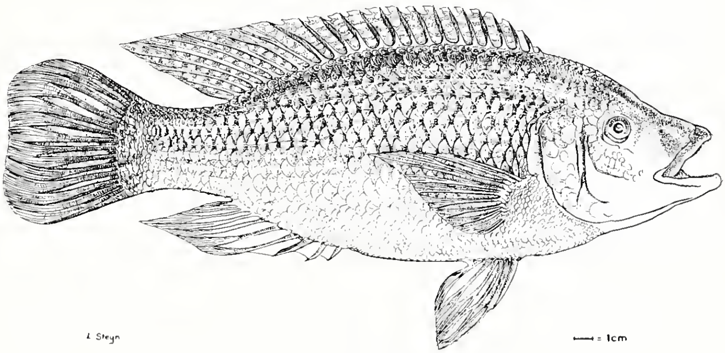
THE FISHES OF THE LOSKOP DAM

By S. S. du Plessis and P. J. le Roux

THE Loskop Dam is a well-known angling resort and from the outset the fish have attracted many visitors. No fish have ever been released in the dam and the species found there were originally in the Olifants River. The fish in the dam may be divided into two groups, namely, those in which anglers are interested, in other words, the game species, and the lesser known and usually smaller fish, which mainly constitute food for the larger species.

Firstly the game species. The well-known and most highly regarded are, of course, the two species of **Kurper** (*Tilapia* sp.), noted for their tasty flesh. The red-finned kurper or bream (*T. mossambica*), also known as the white kurper, blue kurper or large-mouth kurper is a fish which lives on algae and other submerged food growing on the mud, stones, stems of aquatic plants and dead trees in the water. It attains a size of more than five pounds. The males and females differ to such a degree that they were formerly known as two species. The basic colour is a mouse-grey and the dorsal and caudal fins have red edges. In summer, when breeding, the male takes on a very dark colour, almost black. The female is much lighter, with a smaller head and mouth.

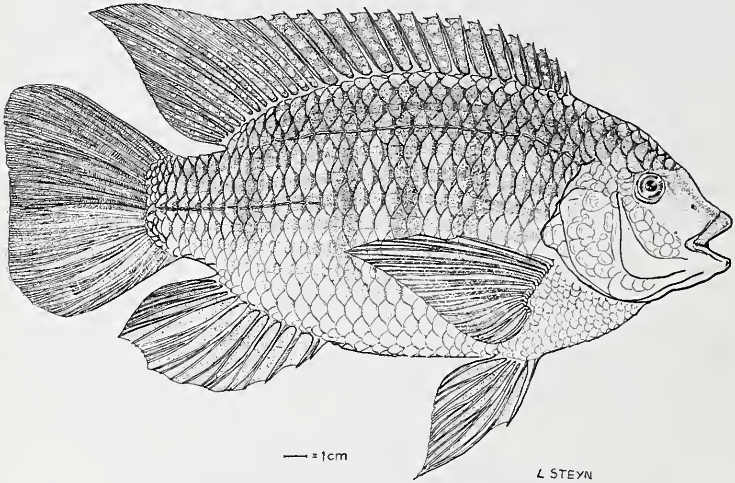
The breeding habits of the red-finned kurper or bream are particularly interesting: the male digs a shallow, saucer-like depression on the bottom in relatively shallow water in the early part of summer. To this end he has developed the large strong mouth which has earned him the name of large-mouth kurper among anglers. Then he lures a mature female to his nest where she spawns. After he has fertilised the ova, she takes them into her mouth and swims about with them while they hatch. Her throat is now expanded downwards in order to enlarge the throat cavity in which the eggs are lying. After the young are hatched and the little yolk sac on which they live during the first few days is consumed, the mother releases them from her mouth so as to enable them to search for food. At the first sign of danger they hastily return to her mouth. From October to March the red-finned kurper is able to rear as many as three batches of young.



Tilapia mossambica—Redfin kurper.

This fish is fairly plentiful in the Loskop Dam and though one could catch it anywhere, the best place is the upper portion of the dam and particularly in Reier Bay. Here the kurper bite exceptionally well from March to May. The best bait is the earthworm, though mealie porridge is also frequently used. As kurpers sometimes move in shoals, the fortunate angler who comes across a shoal could have a fine feast. The daily bag limit is 20 and all kurpers under 6 inches in length must be returned to the water.

The **Red-breasted Kurper** (*T. melanopleura*) is not as plentiful as the previous species, but is nevertheless often caught by anglers on worm bait. It is a herbivore and the soft stems and leaves of water plants form its staple food. It derives its name from the blood-red colour often to be seen on its throat and breast. This colour is, however, not constant and the best means of distinguishing it from *T. mossambica* is by examining the caudal fin. When the caudal fin of *T. melanopleura* is held up to the light, one can clearly see that the colouring of the upper half differs from that of the lower half, the former being darker than the latter.



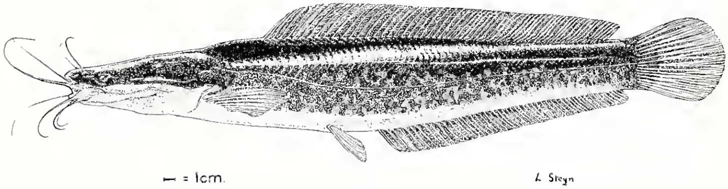
Tilapia melanopleura—Redbreasted kurper.

The eggs of the red-breasted kurper are laid on a stone or any other hard' clean surface. The small olive-green ova are adhesive and stick to the substratum. Where there are soft vertical earth banks, the fish sometimes makes a deep hole in the bank in which it lays the eggs. One parent circulates fresh water over the ova by fin movements while the other parent takes up its position a little further off to scare away any trespassers. They regularly change positions. On hatching, the small fish are taken up into the mouth and placed in one of a number of small holes previously made around the nest. In this hole the little tails of the mass of fry keep moving, apparently to ensure circulation of the water. Each little fish has two slime glands at the back of its head and the sticky matter secreted by them attaches it to the wall of the hole. Every day the young ones are moved to a new hole, presumably for health reasons. The care of the ova and fry is a most strenuous task, especially in the presence of predatory fish. After the fry have absorbed their yolk sacs, they swim about in a concentrated shoal in search of food. Both parents now guard them, although the female is much more active than the male. When one observes these fish breeding in an aquarium, one cannot realise the life of a fish being so complicated.

The **Barbel** (*Clarias mossambicus*) is one of the best known fishes in Africa. Its huge flat head and long feelers strike one immediately. Some people refrain from eating it because of its ugliness. And yet the barbel is one of the most important fish caught by anglers in the Transvaal and as a dish it is not to be scorned. The much disputed " measles " sometimes found in the flesh of the barbel is a parasite found in other fish as well and is harmless to man.

The barbel is a carnivore which devours every conceivable form of food from the small water-flea to other barbel, or small water-fowl and, therefore, takes practically any meat bait.

One often hears of barbel migrating overland and this is quite true. This, however, occurs only overnight when the grass is wet after a rain, for its skin is scaleless and very sensitive to the sun.

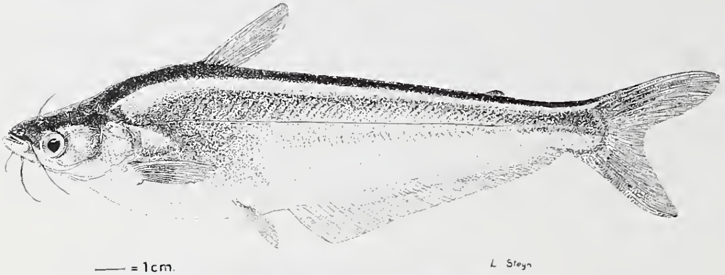


Clarias mossambicus—Barbel.

How can a barbel remain alive so long out of water? The answer is in its ability to breathe air. For an experiment, one should catch a barbel, place it aside and notice how it gapes, that is to say, if it doesn't immediately try to get back to the water. On either side of the back of the head there are cavities communicating with the mouth. Inside these cavities there are tree-like structures richly served with blood. When the barbel lies and gapes in the manner described, it pumps air into these cavities where the " small trees " function as lungs and absorb oxygen. Though a barbel can live long on the dry ground in this manner, it usually succumbs to skin injuries when returned to the water. Even in water it regularly breathes air and many anglers are acquainted with the typical sound of a barbel breaking water in order to breathe.

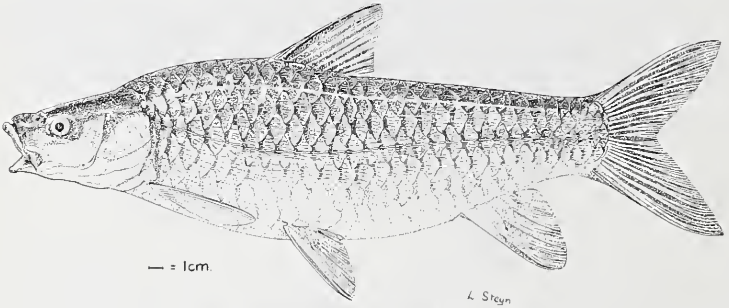
Barbel breed in the summer and lay their adhesive eggs on water-plants early in the morning. The male is easily identified by the long papilla at the point of which the genital opening is visible. This fish grows very large and a barbel of more than twenty pounds in weight is nothing unusual.

Silver Barbel (*Eutropius depressirostris*).—This fine shiny fish is easily identified by its flat head, wide mouth, smooth scaleless skin and the small adipose fin on the back, in front of the tail. It abounds in the Loskop Dam and readily takes earth worms intended for the kurper. Care should be taken in handling them, as the pectoral fins and the dorsal fin contain sharp spines which are able to inflict extremely painful wounds. The silver barbel is a carnivore and seldom weighs more than one pound. The flesh, however, makes exceptionally fine eating.

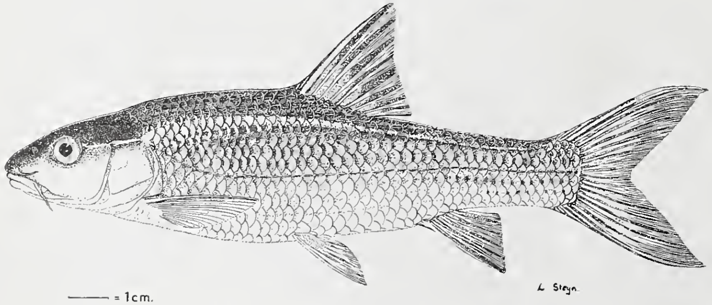


Eutropius depressirostris—Silver Barbel.

Yellowfish.—There are two species of yellowfish in the dam, viz. the large-scale yellowfish (*Barbus marequensis*—previously known as *B. brucii*) and the small-scale Lowveld yellowfish (*Barbus natalensis*—previously



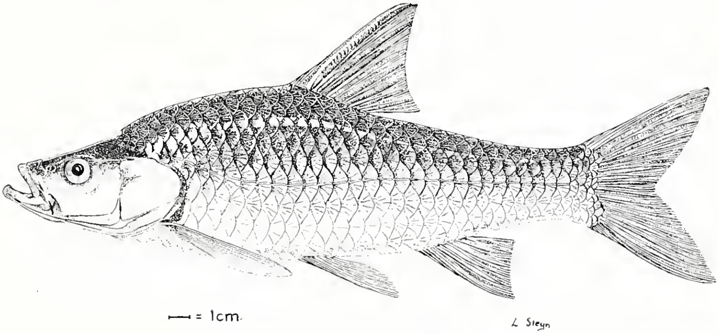
Barbus marequensis—Large-scale Yellowfish.



Barbus natalensis—Small-scale Yellowfish.

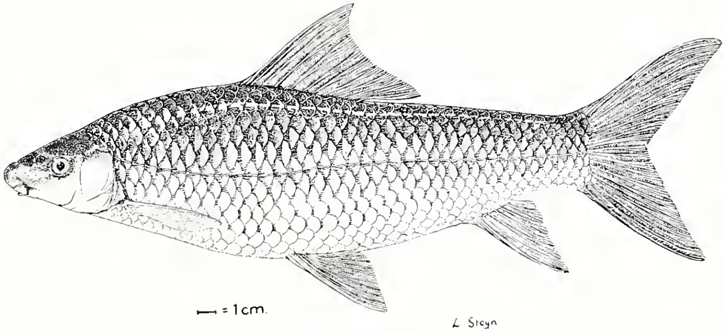
known as *B. marequensis*). The large-scale species is easily identified by the large scales (27 to 33 in the lateral line) and often develops so-called rubber lips. The small-scale species closely resemble the small-mouth yellowfish of the Vaal River (*Barbus holubi*). The colour of both species is yellow in clear water and more silver in turbid water. They bite well on a bait of mealie porridge; but these fish are not very plentiful in the dam.

The **Paper Mouth** or silverfish (*Barbus rapax*) is characterised by its protruding lower jaw and remarkably large eyes. For the rest, its shape is similar to that of a yellowfish, but the colour is more silver and, in clear water, the caudal and anal fins are orange. The paper mouth also differs from all Transvaal yellowfish in that the spine in the dorsal fin is serrated behind. In the Loskop Dam the normal weight of this species is rarely more than half a pound to one pound.



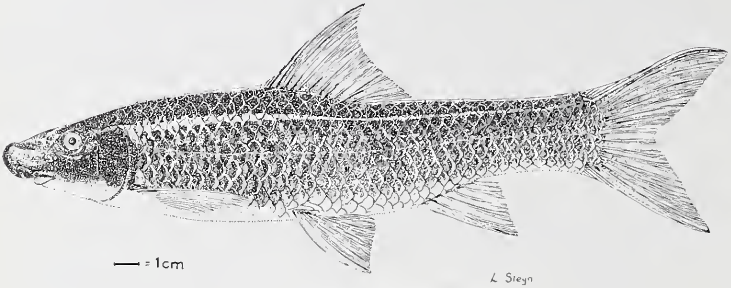
Barbus rapax—Paper-mouth.

Mudfish are not really regarded as angling fishes although some species grow fairly large. In the dam there are two species, namely the red-nose mudfish (*Labeo rosae*) which is very plentiful and the leadfish (*L. cylindricus*). The red-nose is a beautiful silver-coloured fish with a deep body and red tubercles on the nose. In the young, the red colour is not so well developed, but the tubercles are clearly visible. The mouth is small and fairly immovable. This is a powerful swimmer and an excellent jumper. Anglers acquainted with this finest of all mudfish, catch it easily in the Loskop Dam on a bait of mealie porridge.



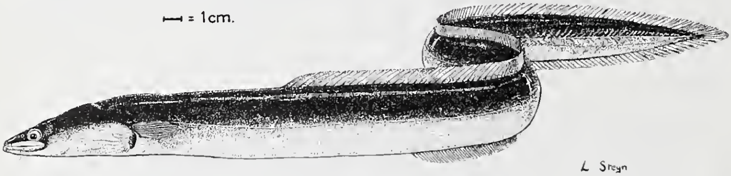
Labeo rosae—Red-nose mudfish.

The leadfish is rather scarce and is characterised by its dark olive colour, a cylindrical body and a large movable sucking mouth opening downwards.



Labeo cylindricus—Leadfish.

Even though some people regard them as snakes, the **Eels** (*Anguilla* species) are genuine fishes. Some anglers allege that the flesh of the eel is the finest eating of all fish. Four species are found in the dam, but they resemble one another so closely, that only an expert is able to discern the differences. The two mostly caught by anglers are, however, the ordinary black eel (*A. mossambica*) and the mottled eel (*A. marmorata*). Both are carnivora.



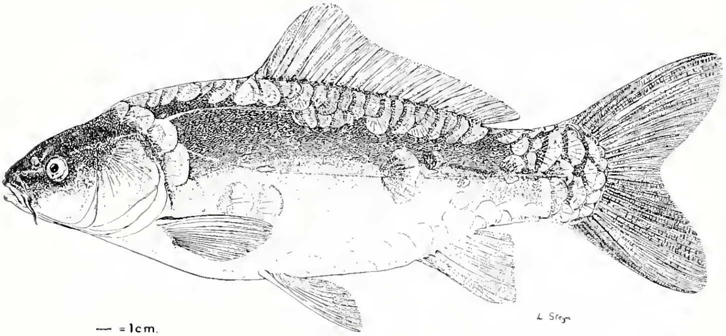
Anguilla mossambica—Black eel.

Young eels of only a few inches in length can sometimes be seen scrambling up the dam wall when the dam overflows. It is interesting to see how they avail themselves of small sidestreams and wet places to surmount such a tremendous obstacle. Eels breed in the sea but live mainly in fresh water.

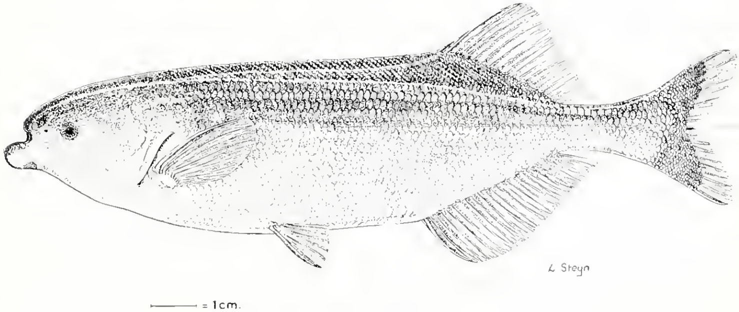
Carp (*Cyprinus carpio*) is the only exotic fish in the dam. Two varieties occur, viz. the mirror carp, which has only a few large scales, and the full-scale carp with regular scales on its entire body.

There remain now the fish not regularly caught by the angler and of these, the largest and also the most peculiar, is the **Bulldog** or beak fish (*Gnathonemus macrolepidotus*), of which there are thousands in the dam up to ten inches long. They eat the small red insect larvae found on submerged water-plants and stones and can sometimes be seen at night with the aid of a torch.

This nocturnal fish is characterised by the peculiar fleshy lower jaw protruding far beyond the upper jaw. The mouth cannot close at all, and because the throat region is also immovable, the fish breathes by rapid vibrations of the operculum. Food is sucked into the mouth.

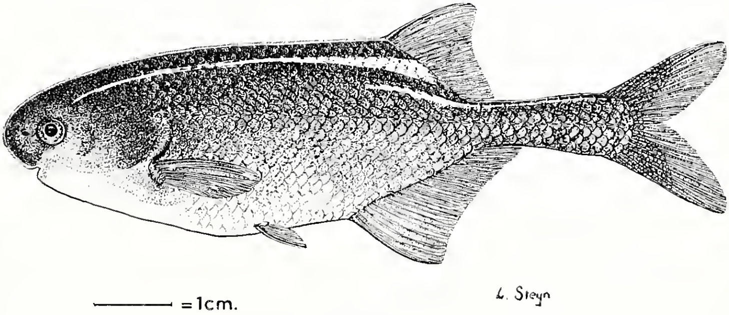


Cyprinus carpio—Mirror carp.



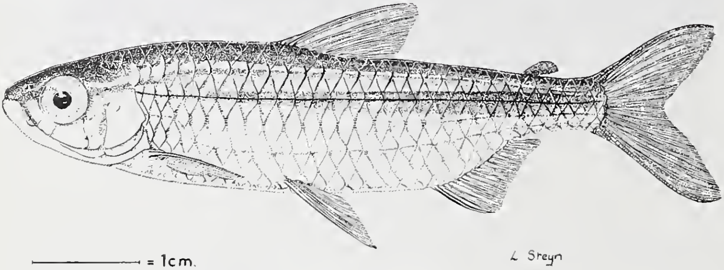
Gnathonemus macrolepidotus—Bulldog.

A closely related species, *Petrocephalus catostoma*, is also found in the dam. This little fish is normally approximately 2 to 3 inches in length and is characterised by the small immovable mouth opening downwards, and by its restless nature.

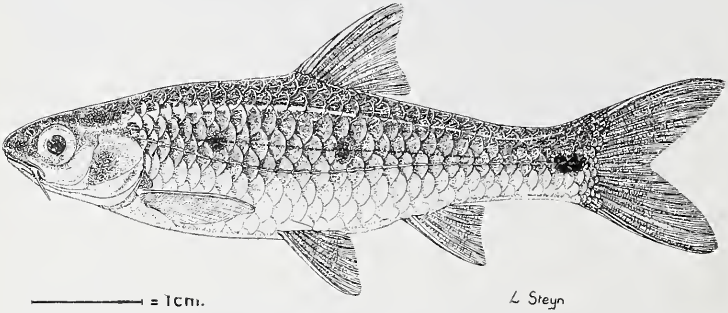


Petrocephalus catastoma.

A small member of the tiger fish family, *Micralestes acutidens*, is sometimes seen in shallow water swimming about with the smaller members of the barbus species, known as " ghieliemientjies ". The " ghieliemientjies" found here, are *Barbus trimaculatus* with three black spots, *B. paludinosus*, *B. labialis* and *B. anoplus*. Together with another small fish, *Engraulicypris brevianalis*, which is almost transparent, they form the staple diet of the larger predatory fish and are also eaten by piscivorous birds.



Micralestes acutidens.



Barbus trimaculatus—Ghieliemientjie.

All these small fish attain a maximum length of approximately 3 to 4 inches and live on plankton, small aquatic life and algae growing on the bottom of the dam.

REPTILES AND AMPHIBIANS OF THE LOSKOP DAM NATURE RESERVE

By Dr. C. K. Brain,

Transvaal Museum, Pretoria,
with photographs by the writer

MANY of the reptiles and amphibians of the Loskop Dam Nature Reserve are secretive animals and a visitor may hardly be aware of their presence. In spite of this, systematic search and observation has shown that a great variety of these cold-blooded animals does exist.

Although lizards are much more numerous than snakes in individual numbers, the variety of species represented is about the same in each case. Concerning lizards, 19 species have so far been recorded and a further nine can be expected to occur; with snakes, 21 species have been obtained while one may predict the presence of an extra nine from a study of their known distributions.

Aquatic reptiles include the African crocodile and water tortoises, very probably of both Transvaal species. The only land tortoise so far recorded from within the limits of the reserve is the Mountain form, *Geochelone pardalis*, but two others are known from adjacent areas.

A systematic study of the amphibia, the frogs and the toads, of Loskop is still to be made. It is possible to predict the occurrence of 15 species of which only five have so far been recorded.

Several of the lizards are colourful and spectacular, males of the large tree Agama, for instance, having brilliant blue heads. Common also is the flap-necked chameleon, remarkable for its colour-change ability and its long projectile tongue.

By far the largest of the lizards is the Nile Monitor or Water Leguan, which may attain a length of 7 feet. Unlike the slightly smaller Rock Monitor (which is also represented) it is seldom found far from water and is a powerful swimmer.

Of the 30 snake species, 13 are devoid of venom and are thus virtually harmless; ten are back-fanged and slightly poisonous, while seven are front-fanged and potentially dangerous. The longest of the snakes are the non-venomous python and the black mamba, known all over the world for its speed and the potency of its nerve poison. The presence of various highly venomous snakes at Loskop need not in any way deter visitors: such snakes are by no means common and seldom cause trouble unless deliberately molested.

A complete list of reptiles and amphibians follows. Species marked with an asterisk have been recorded from the reserve; the presence of the others is suspected from a study of the distribution records.

LIZARDS

1. *Wahlberg's Gecko. *Homopholis wahlbergii.*

One of the larger nocturnal geckos, up to 7 inches in length. Commonly found in holes in dead trees. The feet are provided both with retractile claws and adhesive pads, allowing the gecko to walk easily up a vertical pane of glass. Females are even grey in colour; males are often strikingly marked with black (Fig. 1).

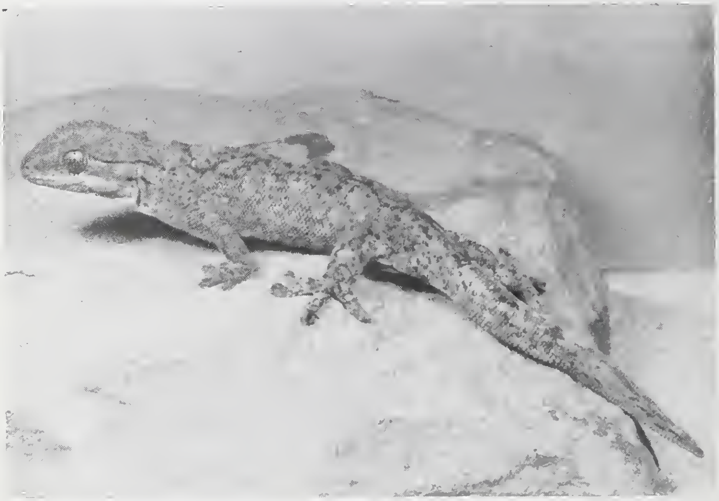


FIG. 1.—*Homopholis wahlbergii*—Wahlberg's Gecko.

2. *Common Dwarf Gecko. *Lygodactylus capensis capensis.*

A small dark grey gecko, reaching a length of about 3 inches. It is frequently seen in the reserve on tree trunks and among loose rocks, close to the water's edge. It is the only gecko in the area active by day. (Fig. 2).

3. *Common Cape Gecko. *Pachydactylus capensis capensis.*

A small purple-brown night gecko, often characterised by its greatly thickened tail. Specimens have been found under stones and in disused termite mounds.

4. *Bibron's Gecko. *Pachydactylus bibronii bibronii.*

A large nocturnal gecko, reaching a length of about 7 inches. The scaling is characteristically rough and several individuals are often found together. Although sometimes said to be poisonous, these geckos are quite harmless.

5. Peter's Spotted Gecko. *Pachydactylus punctatus punctatus.*

A small smooth-scaled gecko usually found under stones.

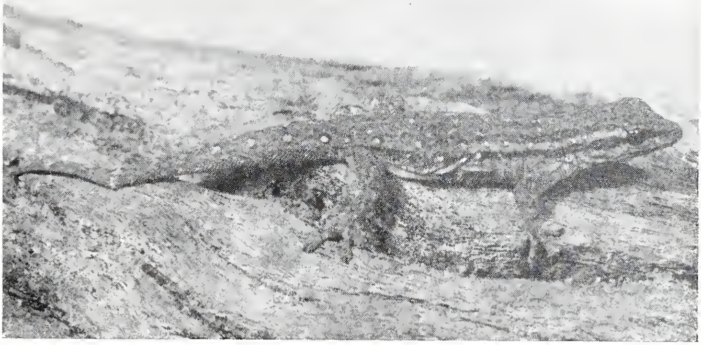


FIG. 2.—*Lygodactylus capensis capensis*—Common Dwarf Gecko.

6. *Tree Agama. *Agama atricollis.*

Males, up to 15 inches long have brilliant blue heads. Pairs of these lizards are commonly seen on trees all over the reserve (Fig. 3).

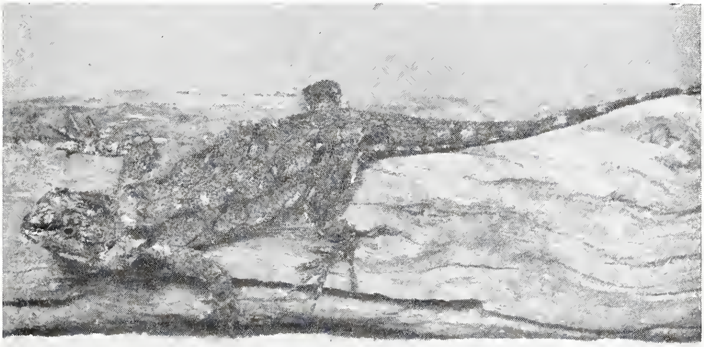


FIG. 3.—*Agama atricollis*—Tree Agama.

7. *Rock Agama. *Agama atra.*

A smaller colourful rock-living form similar in build to the Tree Agama.

8. *Distant's Spiny Agama. *Agama hispida distanti.*

This is probably the commonest Transvaal Agama. It is similar to the previous one although the scaling is rougher.

9. *Common Flap-Necked Chameleon. *Chamaeleo dilepis.*

This well-known reptile has a colour range from pale yellow through green to black. The tongue, used in feeding, may be extended over a distance of 6 to 8 inches.

10. *Pearly Bushveld Skink. *Mabuya quinquetaeniata margaritifer.*

Juveniles and adult females are conspicuously striped and have blue tails. In adult males the striping is lost and the tail becomes orange. Commonly found on rock outcrops near the edge of the dam (Fig. 4).

11. *Cape Three-Striped Skink. *Mabuya capensis.*

Thick-bodied skink, rather slow in movement.

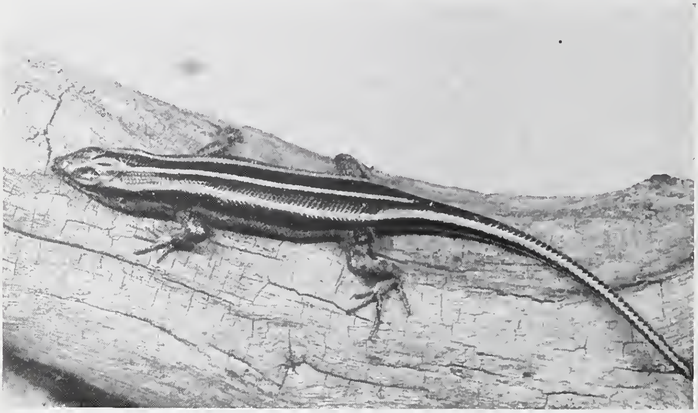


FIG. 4.—*Mabuya quinquetaeniata margaritifer*—Pearly Bushveld Skink.

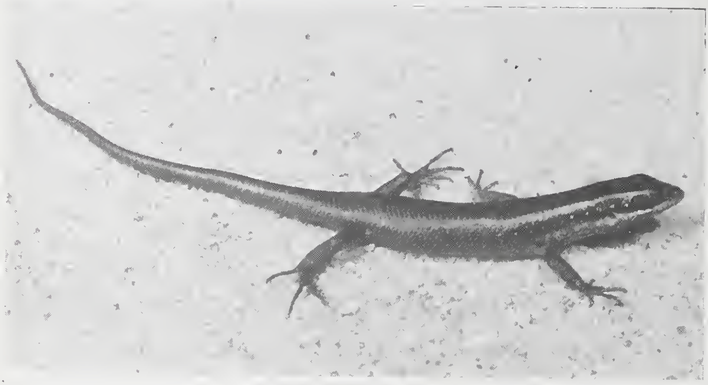


FIG. 5.—*Mabuya striata*—African Striped Skink.

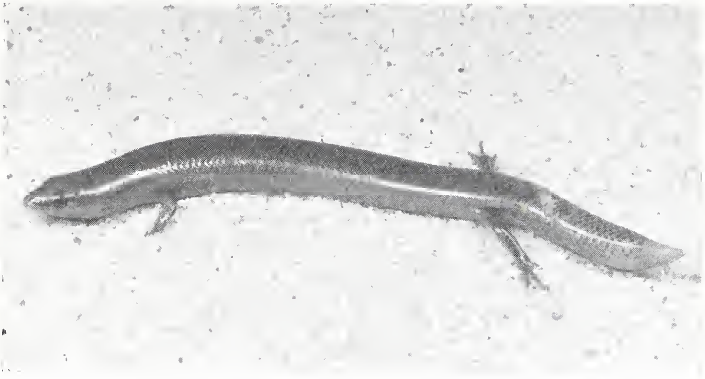


FIG. 6.—*Riopa sundevallii*—Sundeval's Skink.

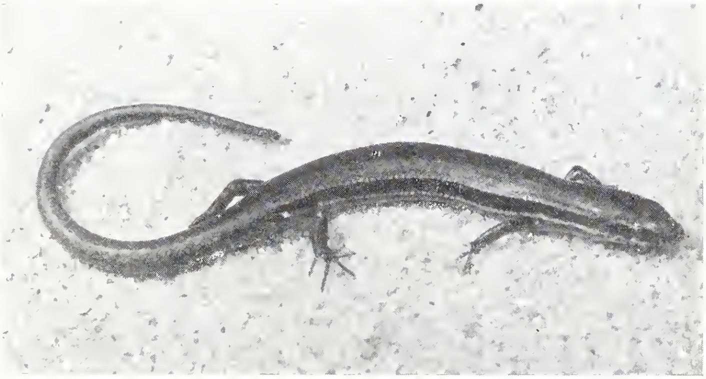


FIG. 7.—*Alepharus wahlbergii*—Wahlberg's Dwarf Skink.

12. *Common Variegated Skink. *Mabuya varia.*

A small and agile lizard. Found throughout the reserve and on the island in the dam.

13. *African Striped Skink. *Mabuya striata.*

A very common lizard often seen in the vicinity of buildings (Fig. 5).

14. Sundeval's Skink. *Riopa sundevallii.*

Legs very reduced. Seldom seen on the surface and living mostly under decayed vegetation (Fig. 6).

15. *Wahlberg's Dwarf Skink. *Ablepharus wahlbergii.*

Small, very slender lizards with reduced legs. Fairly common among rocks at the water's edge (Fig. 7).

16. Smith's Plated Rock Lizard. *Gerrhosaurus validus validus.*

Lizards sometimes over 2 feet in length found on rocky hillsides, particularly in granite country. Has not yet been recorded in the reserve.

17. *Yellow-throated Plated Lizard. *Gerrhosaurus flavigularis flavigularis.*

Active lizards characterised by two black-edged yellow stripes running down the back. Commonly found in dense grass. (Fig. 8).

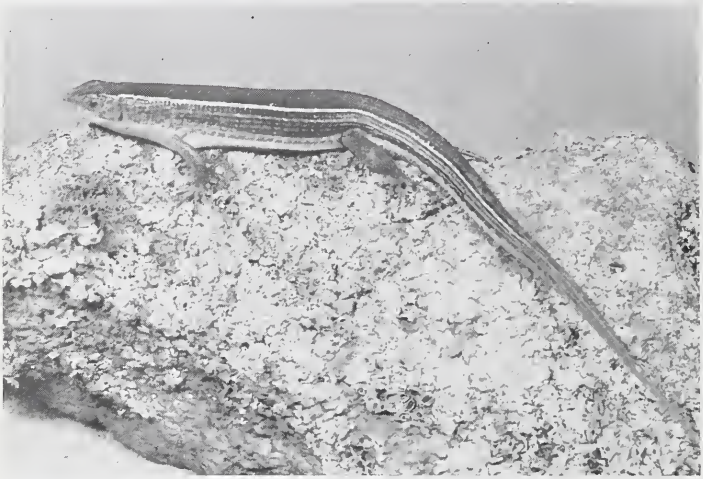


FIG. 8.—*Gerrhosaurus flavigularis*—Yellow-throated Plated Lizard.

18. *Spotted Sandveld Lizard. *Nucras intertexta holubi.*

Small sand lizards particularly active during the hot hours of the day (Fig. 9).

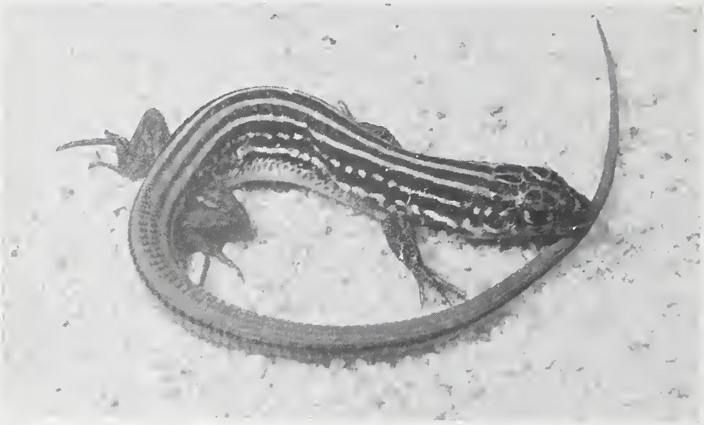


FIG. 9.—*Nucras intertexta holubi*—Spotted Sandveld Lizard.

19. *Ocellated Ground Lizard. *Eremias lineo-ocellata lineo-ocellata.*

Another common Transvaal sand lizard.

20, 21. Rough-scaled Sand Lizards. *Ichnotropis squamulosa* and *Ichnotropis capensis capensis.*

Fast-moving ground lizards.

22. *White-throated Monitor or Rock Leguan. *Varanus albigularis albigularis.*

In contrast to the Water Leguan, this lizard seldom reaches a length of more than 4 feet and is often far from permanent water. Its diet consists of small mammals, birds, eggs, reptiles and insects (Fig. 10).

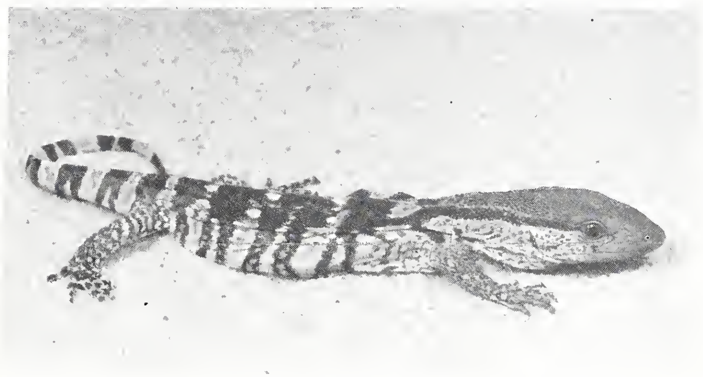


FIG. 10.—*Varanus albigularis albigularis*—White-throated Monitor or Rock Leguan.

23. *Water Leguan or Nile Monitor. *Varanus niloticus.*

The Loskop reserve is an ideal habitat for these large reptiles and they are consequently common. They may be seen round the edge of the dam itself as well as below the wall. Although they will eat practically any animal they can overpower, their staple diet is probably crabs and mussels.

24. Transvaal Snake Lizard. *Chamaesaura aenea.*

A rough-scaled lizard, 12 to 15 inches long, with rudimentary limbs and an extremely long tail. Often mistaken for a snake when seen moving in dense grass.

25. *Transvaal Girdled Lizard. *Cordylus vittifer.*

The scales are underlain by bony plates. Common at Loskop on rock outcrops (Fig. 11).

26. Jones' Girdled Lizard. *Cordylus jonesii.*

A similar lizard to the previous one. Usually on trees.

27. Lesser Caiman Lizard. *Pseudocordylus subviridis transvaalensis.*

Usually found on higher mountain slopes but not yet recorded from the reserve.

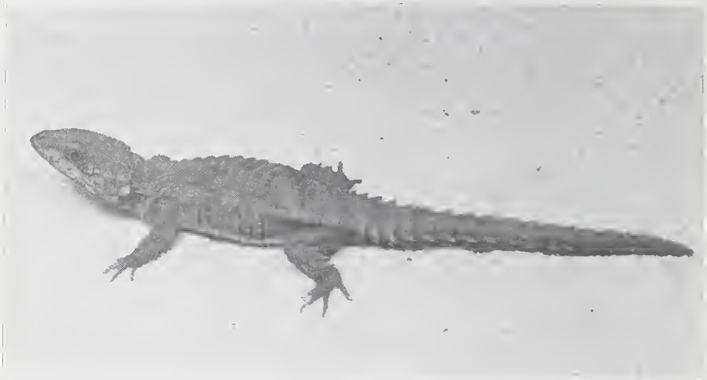


Fig. 11.—*Cordylus vittifer*—Transvaal Girdled Lizard.

28. Transvaal Red-Tailed Rock Lizard. *Platysaurus guttatus guttatus.*

Characterised by the extreme flatness of the body and the brilliant blue and orange colouration.

SNAKES

29. Blind Snake. *Typhlops bibronii.*

A brown burrowing snake with head and tail rather similar in appearance. Harmless (Fig. 12).

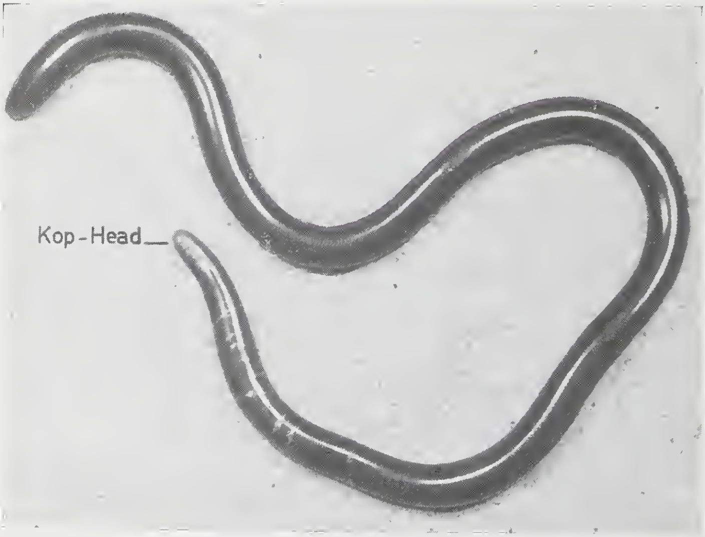


Fig. 12.—*Typhlops bibronii*—Blind Snake.

30. *Worm or Blind Snake. *Leptotyphlops scutifrons.*

Similar to the previous snake but smaller and darker. Harmless.

31. *African Python. *Python sebae.*

These large and well-known snakes are still found in secluded kloofs leading down to the dam. Although specimens of 25 feet have been recorded for the species, such a size is exceptional, 10 to 15 feet being more usual. Pythons are completely non-poisonous but the bite of a large specimen is painful. Prey is killed by constriction, several coils being thrown round the body of the animal which dies of suffocation, being unable to inhale. It is then swallowed whole. Young pythons feed readily on rodents and birds, but older specimens will take larger animals, including small antelopes

32. *Brown Water Snake. *Lycodonomorphus rufulus.*

Two to three feet in length, even brown above, yellow to orange below. Feeds on frogs, tadpoles and fish. Harmless.

33. Aurora Night Snake. *Lamprophis aurora.*

A harmless snake usually about a foot in length. Olive-green with an orange stripe down the middle of the back.

34. *Common House Snake. *Boaedon fuliginosus fuliginosus.*

Three to four feet in length; even brown above, white below. Common snakes in the vicinity of buildings, where they live on mice. Prey is constricted before being swallowed. Harmless.

35. Cape Wolf Snake. *Lycophidion capense capense.*

Small harmless black snakes speckled with white. Often found in disused termite mounds.

36. *File Snake. *Mehelya capensis capensis.*

A 3 to 4 foot snake characterised by its triangular cross-section and its rough scaling. Often thought to be poisonous although quite harmless. Feeds readily on other snakes including such dangerous ones as puff adders.

37. Mole Snake. *Pseudaspis cana.*

A well-known harmless snake feeding mainly on small mammals.

38. Natal Green Snake. *Philothamnus natalensis.*

A brilliant green snake, usually 2 to 3 feet in length and very slender. Usually found close to water where it feeds on frogs. Non-poisonous.

39. *Spotted Bush Snake. *Philothamnus semivariegatus semivariegatus.*

Similar in form to the previous one; green with irregular black markings. Has been recorded from the Loskop rest camp. Harmless.

40. South African Shovel Snout. *Prosymna sundevallii sundevallii.*

A small burrowing snake with a sharp-edged snout specially adapted to underground life. Harmless.

41. Egg-eater Snake. *Dasypeltis scabra scabra.*

Twelve to fifteen inches long, grey-brown marked with black, and not unlike a slender night adder in appearance. Apparently feeds exclusively on eggs, to which diet it is specifically adapted. Harmless.

42. *Tiger Snake. *Telescopus semiannulatus semiannulatus.*

A spectacular orange-brown snake with black transverse bars. Usually about 15 inches long; back-fanged and slightly poisonous.

43. *Red-lip Herald Snake. *Crotaphopeltis hotamboeia hotamboeia.*

A common small snake, characterised by an orange or red upper lip. Back-fanged but not dangerous.

44. Spotted Skaapsteker. *Psammophyllax rhombeatus.*

Slender and fast in movement. Back-fanged and slightly poisonous.

45. Striped Skaapsteker. *Psammophyllax tritaeniatus tritaeniatus.*

Similar in form to the spotted species listed above.

46. *Hissing Sand Snake. *Psammophis sibilans sibilans.*

Back-fanged but not dangerous.

47. *Stripe-bellied Sand Snake. *Psammophis subtaeniatus subtaeniatus.*

A typical slender sand snake characterised by a yellow undersurface. Back-fanged.

48. *Angola Sand Snake. *Psammophis angolensis.*

A back-fanged snake with very distinct longitudinal stripes and transverse markings on the head. One was collected at the rest camp and this represents the first reliable record for the Transvaal (Fig. 13).

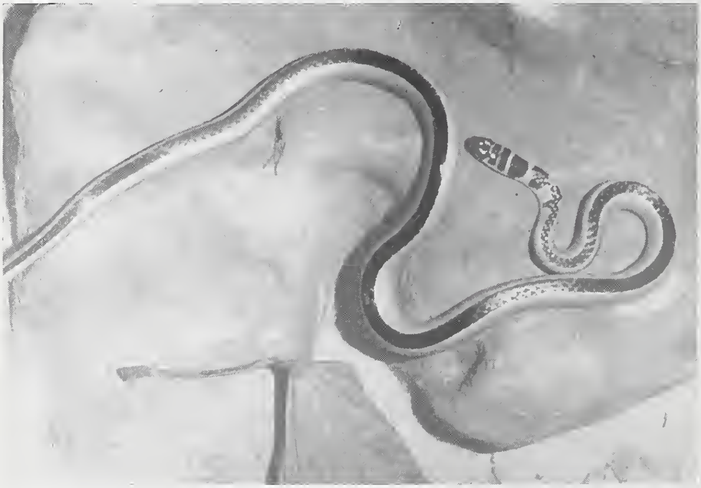


FIG. 13.—*Psammophis angolensis*—Angola Sandsnake.

49. *Bird Snake. *Thelotornis kirtlandii capensis.*

A 3 to 4 foot snake which, when lying motionless in a tree, is easily mistaken for a dead branch. Has the ability to blow up its throat when angered (see photo, Fig. 14). Back-fanged and potentially dangerous.

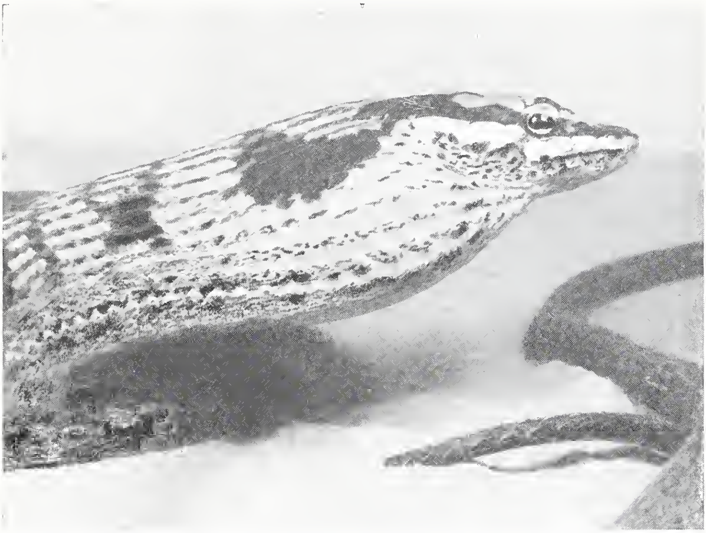


FIG. 14.—*Thelotornis kirtlandii capensis*—Bird Snake.

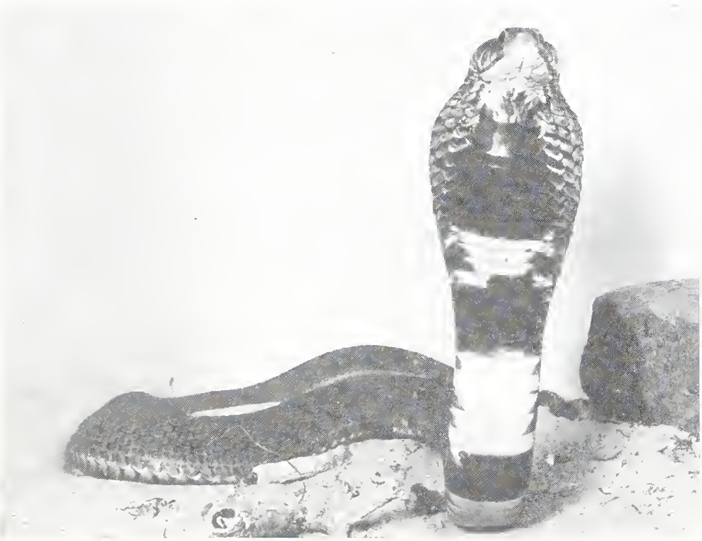


FIG. 15.—*Hemachatus haemachates*—Rinkals.

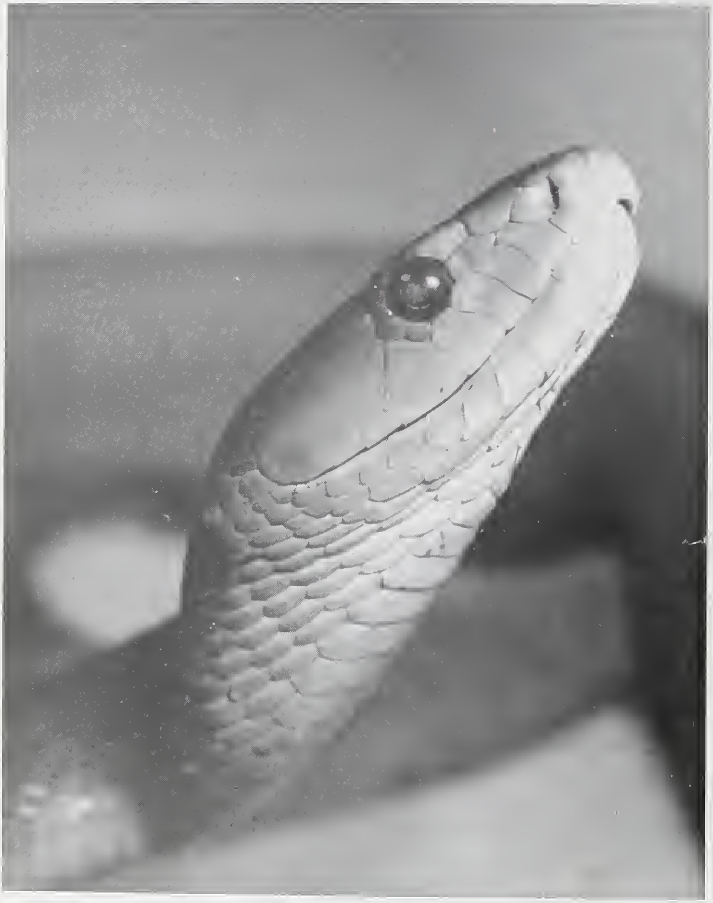


FIG. 16.—*Dendroaspis polylepis*—Black Mamba.

50. *African Tree Snake. *Dispholidus typus.*

Either green or brown and often 5 feet in length. Very frequently mistaken for a green mamba. Although back-fanged, the venom is highly toxic and bites have caused several deaths.

51. *Black-headed Snake. *Aparallactus capensis capensis.*

Small snakes, seldom more than a foot long, but with black heads. Commonly found in termite mounds; back-fanged but virtually harmless.

52. *Egyptian Cobra. *Naja haje haje.*

The common cobra, up to 7 feet in length, either plain brown or transversely banded with black, Able to expand a wide hood; front-fanged and dangerous.

53. *Black-necked or Spitting Cobra. *Naja nigricollis nigricollis.*

Although this snake may be confused with the Egyptian Cobra, it is able to spit its venom over a distance of several feet. Front-fanged and very poisonous.

54. *Rinkals. *Hemachatus haemachates.*

Not a true cobra, but able to expand a hood and spit its venom. Darker in colour than the Spitting Cobra and with keeled scales. Reaches a length of 4 feet; front-fanged and dangerous (Fig. 15).

55. *Black Mamba. *Dendroaspis polylepis.*

Two species of mamba occur in the Union, the green (*D. angusticeps*) and the black. The former is found in Zululand and down the Natal South Coast, while the latter has a much wider distribution over the bushveld areas of the country. Both snakes are highly venomous but the black mamba may be more dangerous since it is a larger snake, up to 14 feet in length, and has more powerful venom. The numerous reports of green mambas in the Transvaal can nearly always be attributed to the boomslang, although young of the black mamba are a dark olive-green colour, which gradually darkens with age to the characteristic brown or brownish-black of the adult. When it has just shed its skin, an adult black mamba frequently shows a greenish sheen. These snakes are front-fanged, while the venom affects the nerves, causing rapid paralysis of the breathing mechanism (Fig. 16).

56. *Night Adder. *Causus rhombeatus.*

Usually 1 to 2 feet in length, grey-brown with black diamond-shaped markings and a prominent black V on the head. Front-fanged and venomous (Fig. 17).

57. *African Puff Adder. *Bitis arietans arietans.*

A very well-known heavy-bodied and sluggish adder. Front-fanged and dangerous.

58. *Bibron's Burrowing Adder. *Atractaspis bibronii.*

An elongated black snake usually about 15 inches in length, easily mistaken for a harmless species. Although not adder-like in form, it has long folding fangs and powerful venom and this, together with the fact that it bites very readily, makes it decidedly dangerous (Fig. 18).

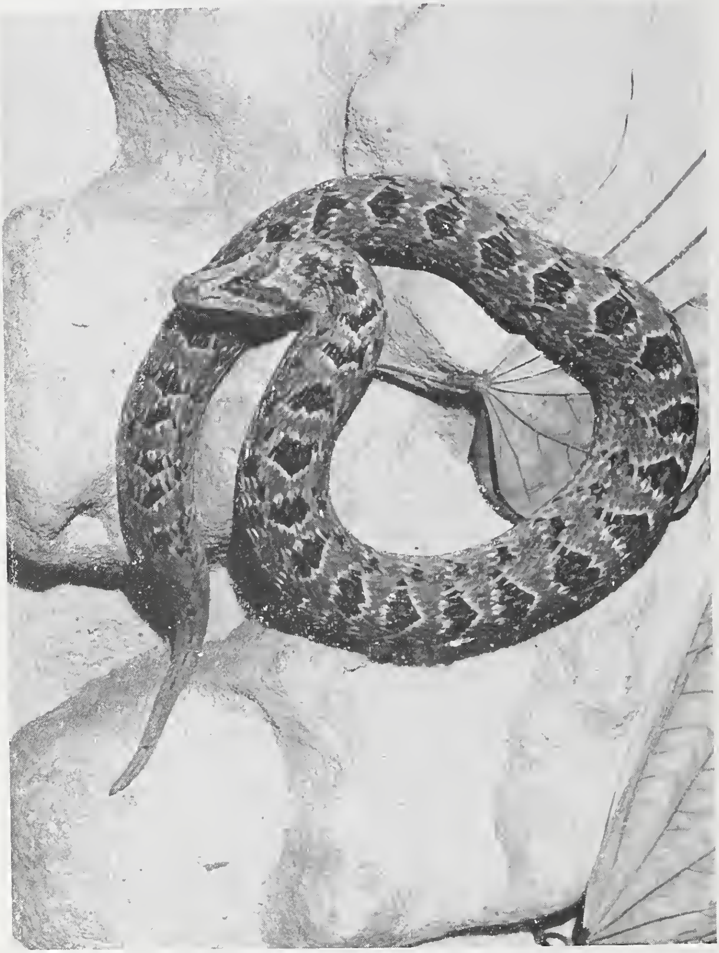


FIG. 17.—*Causus rhombeatus*—Night Adder.

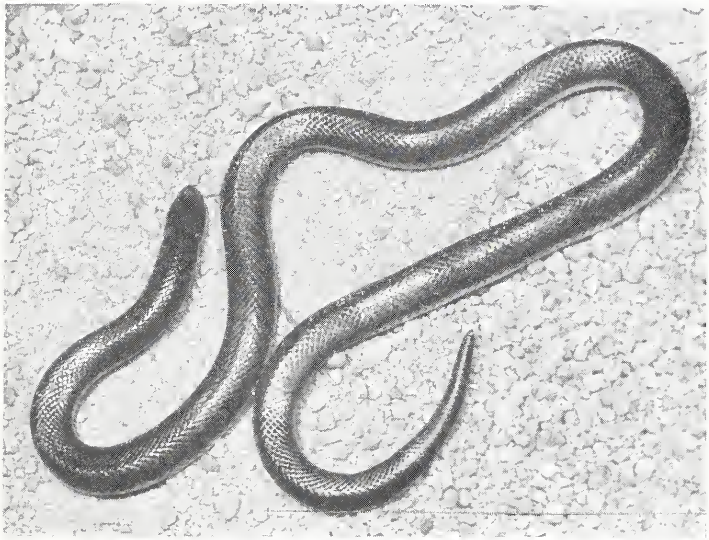


Fig. 18.— *Atractaspis bibronii*—Bibron's Burrowing Adder.

AFRICAN CROCODILE

59. **Crocodylus niloticus.*

The common African crocodile is plentiful in the upper parts of the dam. Its diet varies according to the size of the specimen concerned: when very young it will readily eat frogs, small fish and water insects. Grown specimens eat large numbers of fish, as well as any animal which may be overpowered when coming down to drink. Usual adult size is about 12 feet, although specimens of 16 feet, weighing approximately a ton, have been recorded. Eggs generally 30 to 50 in number, are laid in the sand of the river banks and the spot may be guarded by the mother until the young emerge.

LAND TORTOISES

60. *Eastern Leopard Tortoise or Mountain Tortoise. *Geochelone pardalis babcocki.*

A very widespread African tortoise ranging from the Sudan to the Cape Province. May reach a considerable size: one specimen weighing 69 lbs. has been recorded. One of these tortoises was found swimming in the Loskop Dam, nearly half a mile from the shore, perhaps having been washed into the water during heavy rain. On being placed in the boat, it was so hungry that it attempted to eat some rope (Fig. 19).

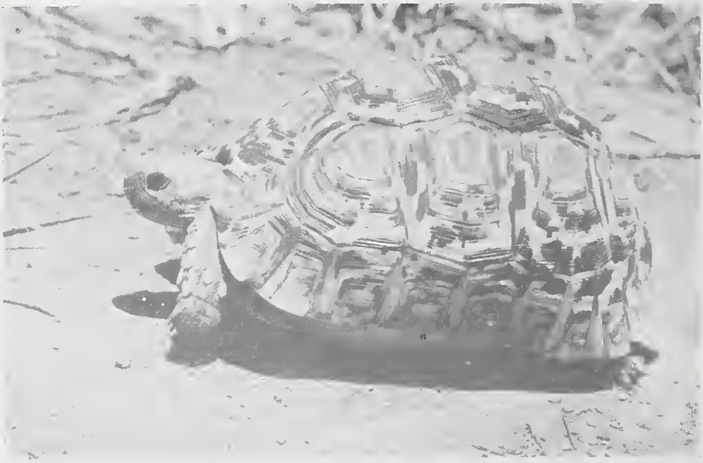


FIG. 19.—*Geochelone pardalis babcocki*—Eastern Leopard Tortoise or Mountain Tortoise.

61. Bell's Eastern Hinged Tortoise. *Kinixys belliana belliana.*

Another tortoise with an extremely wide African distribution. Characterised by a transverse hinge in its carapace, allowing the posterior portion to be bent downwards.

62. Serrated Tortoise. *Psammobates oculifer.*

A small high-backed form characteristic of the drier parts of South Africa. It has been recorded from Marble Hall so will probably be found at Loskop as well.

WATER TORTOISES

Water tortoises do occur in the Loskop Dam and can occasionally be seen basking on mud banks or partially submerged logs. From time to time they are caught by anglers. Two species should occur:—

63. Common African Water Tortoise. *Pelomedusa subrufa.*

64. Smith's Water Tortoise. *Pelusios sinuatus.*

FROGS AND TOADS

Unless they are specially looked for, it is unlikely that a great variety of amphibians will be seen at Loskop. Particularly common however are the Garden- and Red-toads, which live on land but return to the water to breed. Large green bullfrogs are occasionally seen, often in rather small pools. Several species of Rana, or river frogs, are encountered along the edge of the dam. A list follows.

65. *Platanna. *Xenopus laevis.*

An exceptional frog in that the three innermost toes on each hind foot bear claws. Several species of these clawed frogs exist but all are confined to Africa. Claws are very unusual features among frogs but in the case of the platanna are certainly very useful when feeding. Large pieces of food held in the mouth are torn by the claws as the hind feet are kicked forward past the sides of the head. These frogs are essentially aquatic and are very competent swimmers; on land they move by a series of clumsy jumps.

66. *Common Garden Toad. *Bufo regularis* (Fig. 20).

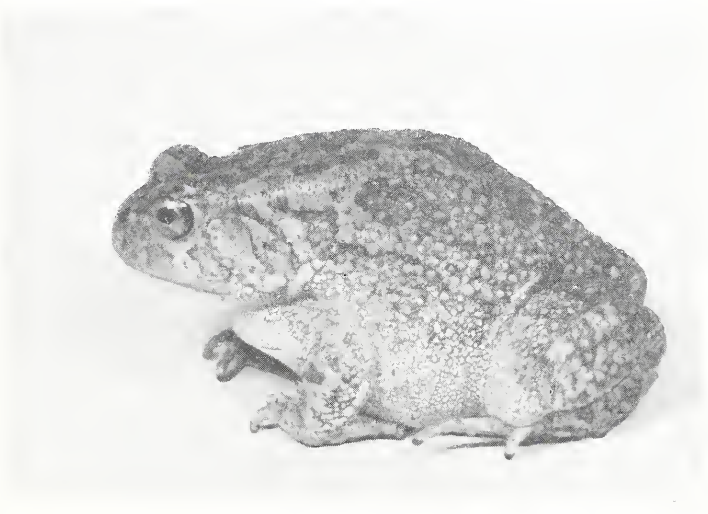


FIG. 20.—*Bufo regularis*—Common Garden Toad.

67. *Red Toad. *Bufo carens.*

68. Dwarf Toad. *Bufo fenhoulheti.*

69. Sharp-nosed Grass Frog. *Rana oxyrhynchus.*

70. *Common Transvaal River Frog. *Rana angolensis.*

71. Striped Grass Frog. *Rana fasciata.*

72. *African Bullfrog. *Rana (Pyxicephalus) adspersus adspersus.*

Quite the largest of the Transvaal frogs, specimens with a body length of 7 inches being often encountered. These are typically bright green above but yellow below. Food apparently consists of any animal which can be overpowered, such as insects, other frogs, mice and small birds. The jaws of a large bullfrog are powerful and its bite is often painful.

Specimens should usually be looked for in small temporary pools; here the water is warmed by the sun and the eggs and tadpoles develop rapidly, completing their early development before the pools dry up again. When this happens, the young frogs retire underground. (Fig. 21).

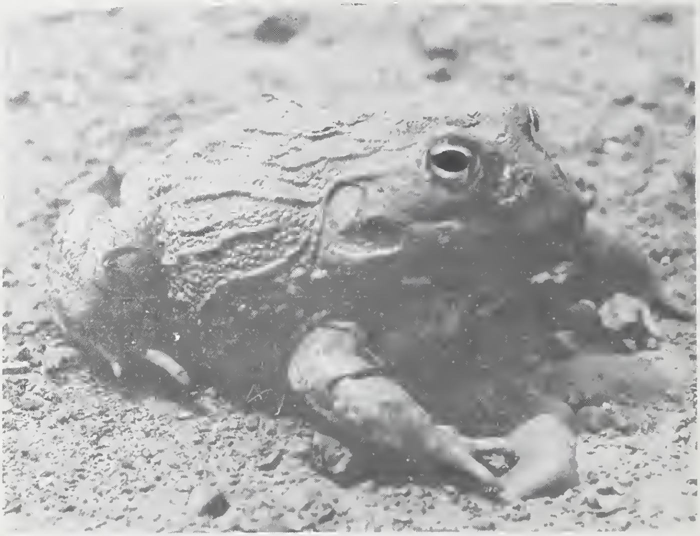


FIG. 21.—*Pyxicephalus adspersus*—African Bullfrog.

73. Delalande's Burrowing Frog. *Pyxicephalus delalandii.*

74. Natal Burrowing Frog. *Pyxicephalus natalensis.*

75. Natal Dwarf Burrowing Frog. *Phrynobatrachus natalensis.*

76. Boettger's Dwarf Frog. *Cacosternum boettgeri.*

77. Senegal Kassina. *Kassina senegalensis.*

78. Red and Black Frog. *Phrynomerus bifasciata.*

79. Transvaal Breviceps. *Breviceps adspersus.*

When disturbed, these small frogs have the ability to blow themselves up until they are almost spherical. The head is extremely short, hence the name *Breviceps*, and the legs are not adapted to jumping, but rather to slow walking. Most of the time is spent below ground, coming to the surface only during rains. On such occasions they may be seen in large numbers. When digging, they make use of the spade-like scoops on their hind feet and dig in backwards, kicking the feet outwards. Unlike most frogs, they do not lay their eggs in water, but in a damp situation under a stone or in the ground. The young go through the tadpole stage in the egg capsule, to emerge as small but fully formed frogs.

BIRDS OF THE LOSKOP DAM NATURE RESERVE

By O. P. M. Prozesky,
Transvaal Museum, Pretoria

Bracketed numbers refer to the Revised Edition of " Birds of South Africa ", by Austin Roberts

THE birds of Loskop can be divided into three main groups, viz.:—

(*a*) Birds on and around the water,
(*b*) birds of the bush, and
(*c*) birds of the high plateau.

Notwithstanding the fact that the dam has been in existence for about 25 years, there is a marked scarcity of waterfowl. This phenomenon is found throughout the permanent waters of the Lowveld. At Loskop one of the main reasons is the lack of suitable feeding grounds for most aquatic birds. Except for a short period in the winter months when the water level is low, there are hardly any mud-flats. The banks of the dam are steep and stony, with the result that there is little food for most ducks and waders.

The waterfowl can be classified into two types: the resident birds and the occasional visitors. Egyptian Geese (89) are common. They are found all along the shores in pairs during the breeding season. At other times they occur in family groups or small flocks. A favourite nesting site is the small island off the dam wall. Being grazers they are not dependent on mud-flats. On the narrow upper reaches of the dam Black Duck (95) are to be found. They mostly occur on rivers edged with trees and not so much on open water. Dabchicks (6) and Coot (212) are found throughout the year. A few Yellow-billed Duck (96) are seen regularly. A flock of about 90 was seen on a mud-flat during early spring when the dam was at a very low level. Red-bill Teal (97), White-faced Whistling Duck (100), South African Pochard (102) and Knob-billed Duck (91) are occasional visitors. During September and October many hundreds of Spurwing Geese (88) spend some weeks at the dam, during which period they undergo a complete moult and are unable to fly. After their moult they depart and only odd small flocks are seen throughout the year.

Cormorants are fairly common. White-breasted Cormorants (47) nest on the dead trees standing in the water. Reed Cormorants (50) are less common. Darters (52) are often to be seen, drying their outstretched wings, or swimming with only their thin necks and heads showing above the surface. During September some of them were also found unable to fly owing to a complete moult.

Grey Heron.

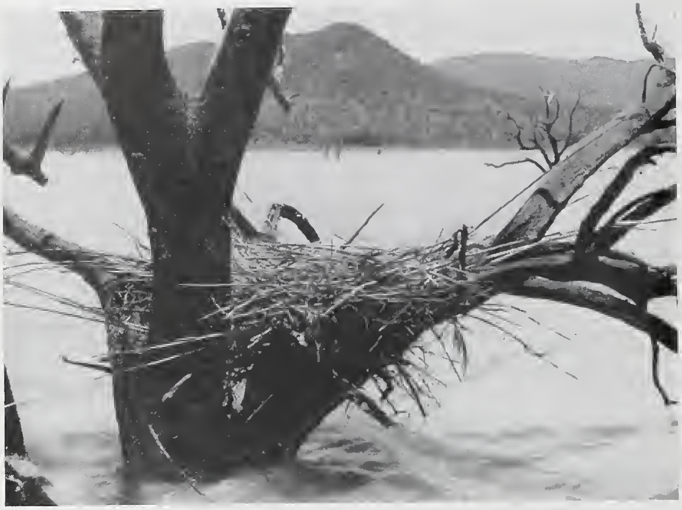
[Photo: G. de Graaff]

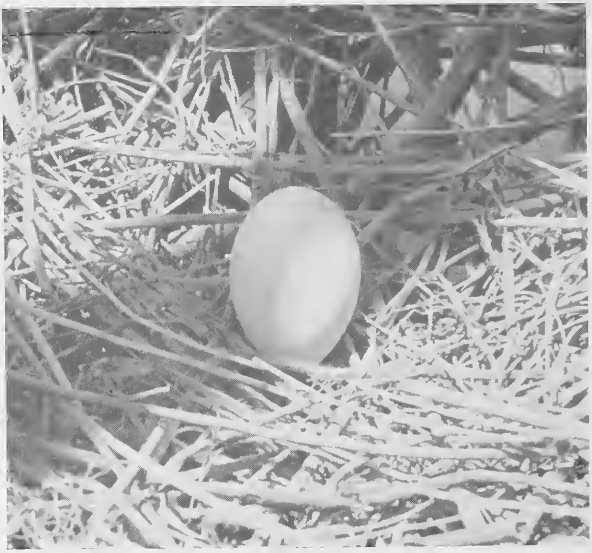
White-breasted Cormorant at nest.

[Photo: G. de Graaff]

Grey Heron nest.

[Photo: C. K. Brain]





Goliath Heron nest . . . and her egg. [Photo: C. K. Brain

Black-headed Heron at nest.

[Photo: Clem Haagner]

The Heron family is well represented. Many of them breed in the dead trees standing in the water while others make use of the trees on the banks. The most common is the Grey Heron (54). A few pairs of Goliath Herons (56) are resident and Black-headed Herons (55), Great White Herons (58), Little Egrets (59), Yellow-billed Egrets (60) and Night Herons (69) are to be seen. Along the banks flocks of Cattle Egrets (61) are sometimes found accompanying game and cattle coming to the dam to drink. On the water's edge the Three-banded Sandplover (238) is seen throughout the year. On the mud-flats Wood Sandpipers (264) and Greenshanks (263) feed and along the stony banks Common Sandpipers (258) are to be found during the summer months. Small flocks of White-winged Lake Terns (304) pay the dam an occasional visit.

When conditions are suitable Flamingoes (86) and Spoonbills (85) rest for a few days in the shallow water of the upper reaches on their migration flights. Both the Cape (275) and the Water Dikkop (274) occur in the bush and near the water's edge. On the grassy flats near the water's edge one finds many pairs of Wattled Plovers (247) and also some odd Blacksmith Plovers (245). The well-known call of the Hadeda Ibis (84) often re-echoes from the surrounding mountains, and Sacred Ibis (81) also occur. The Hamerkop (72) is often seen and nests in suitable large trees on the shore.

Cape Wagtails (686) and Pied Wagtails (685) occur side by side and are even found in the rest camp. The immature Pied Wagtail is grey and white and not black and white as in the case of the adult bird. In the reeds

Dikkop with eggs.

[Photo: Clem Haagner]

bordering the water the Cape Reed Warbler (604) abounds. During summer the migratory Great Reed Warbler (603) and the seldom seen European Sedge Warbler (608) frequent the reeds and sedge. In the tall grass of the few small streams flowing into the dam the Grassbird (618), le Valliant's Cisticola (646), and the Tawny-flanked Prinia (649) have made their home. The shy Black Crake (203) now and again shows itself at the edge of the vegetation bordering the dam. The African Jacana (228), usually found where waterlilies grow, is sometimes seen stalking on the mud-flats, catching insects.

The Giant Kingfisher (395), flying fast and low over the water, and the Pied Kingfisher (394), hovering over shallow water, diving down and emerging with a wriggling fish in its bill, are well-known sights. The beautiful Half-collared Kingfisher (396) is only to be found far up the river. The Natal Kingfisher (398), the Brown-hooded Kingfisher (402), and the Striped Kingfisher (403), although no longer true fishermen, having adopted an insectivorous diet, can be seen near the dam, but are usually found in the bush far from water.

The most imposing sight on the dam is surely the Fish Eagle (149), diving from a great height on to an unsuspecting fish with an enormous splash. There are two or three pairs at Loskop, each adhering strictly to its own territory. During mid-summer the adults may be seen accompanied by an immature bird of uniform brown colour. The high-pitched call of this eagle while soaring high above the dam is a sound well-known at Loskop. The Marsh Harrier (167) can also be seen flying low over the reeds.

Marsh Harrier at nest.

[Photo: Clem Haagner]

Many species of swallows are found over the dam. In summer European (493) and White-throated Swallows (495) are common. The Larger Striped Swallow (502) also occurs. The Lesser Striped Swallow (503) is found throughout the year. Rock Martins (506) can be seen at any time and the Banded Sandmartins (510) only in summer. In the more open country Red-breasted Swallows (501) occur in pairs, and with luck the beautiful Blue Swallow (497) may be seen. Of the Swifts, the following have been recorded: the Black (380), the White-rumped (383), the Little (385) and the Giant Swift (386).

The greatest variety of birds is found among the trees on the mountain slopes, and especially in the ravines. The Ostrich (1), which has been re-introduced, is doing very well and is increasing rapidly. Year after year the Secretary Birds (105) breed on the crowns of suitable trees. Game birds, viz. Coqui Francolin (173), Crested (174) and Swainson's Francolins (185) are more often heard than seen. Large flocks of Crowned Guineafowl (192) come to the water for their daily drink.

Rock Pigeons (311) breed in the cliffs and fly to distant cultivated lands to feed. The Laughing Dove (317) is the most common and the Cape Turtle (316) and Red-eyed Turtle Dove (314) are sometimes seen. In the ravines the mournful call of the Emerald-spotted Wood Dove (321) can be heard.

Ostriches at Loskop.

[Photo: J. Meester]

Secretary Bird incubating.

[Photo: Clem Haagner]

A well-known summer visitor is the Grey Loerie (339) or " Go-away Bird ". Often a party of the noisy Red-billed Hoopoe (419) passes by, searching the bark of tree trunks and branches for insects. The Scimitar-bill Hoopoe (421) is seen singly or in pairs while on a similar quest. The African Hoopoe (418) is often seen on the lawns of the camp, searching for insects.

The Red-chested Cuckoo (343), also known as " Piet-my-Vrou ", is regularly heard in summer, even calling continuously during bright moonlight nights. Diederik (352) and Klaas's Cuckoos (351) are often heard and seen. In the reeds bubbling notes may reveal the presence of Burchell's Coucal (356). Parties of Red-faced Coly (392) are found in the more open thorn bush, whereas the Speckled Coly (390) is usually observed in the more dense growth.

A colony of White-fronted Bee-eaters (409) has been found below the dam wall. During midsummer European Bee-eaters (404) arrive in large flocks. They are often heard calling while flying high overhead. They also sit on telegraph wires, from where they feed on insects taken from the air. In the more open spaces Little Bee-eaters (410) are found, usually in pairs. Sitting on a dead branch, or some point of vantage, they dart off at lightning speed to snap up insects flying past.

A common sight along the mountain slopes is the floppy flight of the South African Grey Hornbill (424). Their plaintive " pee - u " whistle is repeated again and again. They breed in holes in trees and are seen throughout the year. Yellow-billed Hornbills (426) on the other hand are scarce and with luck one may see an odd bird during summer.

Around the camp Barbets are plentiful. The purring trill of the Crested Barbet (439), continued for minutes on end, is charactersitic. The Black-collared (431) and Pied Barbets (432) are regularly seen, especially when the wild fruit and berries are ripening. The Loskop area is very interesting as the Red-fronted (436) and the Yellow-fronted Tinker Barbets (437) are found side by side. Both the Cardinal (450) and the Golden-tailed Woodpecker (447) have been observed. In the wooded ravines one occasionally catches a glimpse of the Greater Honeyguide (440).

The fork-tailed Drongo (517), hawking insects in the air, is a familiar sight. In the larger trees the Black-headed Oriole (521) is found and its melodious whistle is often heard. The Black Cuckoo-shrike (513) with its cricket-like call, frequents the denser bush. Black Tits (527) fly chirping from tree to tree in search of insects. Parties of noisy Arrow-marked Babblers (533) are regular visitors to the Rest Camp, where Black-eyed Bulbuls (545), Kurrichane (552), Cape (553) and Groundscraper Thrushes (557) are common.

On the stony mountain slopes Cape Rock Thrushes (559), Mountain (564) and Mocking Chats (573) are observed, whilst the Familiar Chat (570) often prefers the neighbourhood of human habitations.

In the dense undergrowth the Cape (581) and White-throated Robins (582) are at home. The White-browed Scrub Robin (588) is found in the more open thorn veld.

Small insectivorous birds abound. The Neddicky (637), Crombec (621), Bar-throated Apalis (622) and Tit-babblers (658) are seen busily searching the trees for insects. During summer they are joined by the migratory Willow (599) and Garden Warblers (595). On one occasion the rare Icterine Warbler (596) was observed. Throughout the year the Fiscal Flycatcher (665) and the White-flanked Batis (673) are seen. During summer months the European Spotted Flycatcher (654) is one of the most common birds in the Camp, where numerous pairs of Paradise Flycatchers (682) have become quite an attraction. Now and again the tiny Fairy Flycatcher (678) makes its appearance.

The Shrikes are well represented. The Fiscal (707) and Puffback Shrikes (712) are most numerous. On the mountain slopes the Three-streaked (714) and Black-crowned Tchagra (715) are resident, to be joined there by the migrant Red-backed Shrike (708) in summer. In the ravines the loud duet-whistle of the Boubous (709) is unmistakable. The short-tailed Brubru (731) and the Crimson-breasted Shrikes (711) are occasional visitors, and flitting about in the thorn trees searching for insects one might find a party of White Helmet Shrikes (728).

One of the most beautiful birds in the Reserve is the Plum-coloured Starling (736). The Cape Glossy Starling (737) also makes a regular appearance. The least timid of all the birds are the Sunbirds which allow one to approach within a few feet of them while feeding on the aloes in the Camp, The Marico (755), Greater Double-collared (758), White-breasted (763).

and Black Sunbirds (772) have been recorded. Cape White-eyes (775) have been found building their small cup-shaped nests near the huts. Masked Weaver (803) colonies are scattered all over the Reserve and Red Bishop Birds (808) and White-winged Widows (814) are frequently seen. Now and then a swarm of Red-billed Quelea (805) makes its appearance.

Paradise Flycatcher. Male busy building nest.
[Photo: G. de Graaff]

Small seed-eating birds are very numerous. When conditions are suitable, large numbers of Bronze Mannikins (823), Blue Waxbills (839), Scaly-feathered Finches (789), Orange-breasted Waxbills (838) and Common Waxbills (843) are seen. In summer Pin-tailed Whydahs (846), which parasitise Common Waxbills, are often found. Violet-eared Waxbills (840) and Fire-finches (833) are not so numerous.

At all times Streaky-headed Seed-eaters (867), Yellow-eye Canaries (859), Grey-headed Sparrows (787), Black-throated Canaries (860), Rock (872) and Golden-breasted Buntings (874) are fairly common. During the last few years the House Sparrow (784), introduced from Europe, has made its appearance in the Camp. Its numbers are controlled as these birds tend to drive away the Paradise Flycatchers and other indigenous birds.

The higher lying plateau consists of more open ground with sparsely scattered trees. Birds of prey are represented by the Naumann's Kestrel (125), the Steppe Buzzard (154) and the Black-shouldered Kite (130). Lanner Falcons (114) found there, breed on the high cliffs. On rare occasions Stanley Cranes (216) are found striding about in the veld in search of food. Crowned Plovers (242) are not uncommon in suitable localities. The Larks are represented by the Sabota (460), the Clapper (466), and the Rufus-naped Lark (458). The latter can often be seen sitting on some small tree or fence post, giving its well-known call. Richard's Pipits (692) and Cape Longclaws (703) appear side by side with Ant-eating (575) and Stone Chats (576). Common Fantail Cisticole (629) are numerous and small flocks of Quail Finches (844) occur. Both Pied (522) and Black Crows (523) are found and occasionally Pied Starlings (746) are seen. Red-billed Oxpeckers (748) are observed catching ticks on game and cattle. The only eagles to have been recorded are the Martial Eagle (147) and the Tawny Eagle (134). The absence of vultures, also noticed by the officials of the Reserve, is inexplicable. With the re-introduction of game and the many suitable cliffs for nesting sites, it will probably be only a matter of time before they make their appearance.

Lanner Falcon.

[Photo: Clem Haagner]

The above list of close on 200 species is compiled from notes made during four survey trips covering all seasons. According to distribution maps many more species should occur in this interesting area where Highveld and Bushveld meet. Use was also made of a list of birds compiled by the Witwatersrand Bird Club and kindly made available by the Director of Nature Conservation. The co-operation of all officials and individuals who helped with the survey is greatly appreciated. The photographs were supplied by Mr. Clem Haagner, Dr. C. K. Brain and Messrs. G. de Graaff and J. Meester.

MAMMALS OF THE LOSKOP DAM NATURE RESERVE

By J. Meester,

Transvaal Museum, Pretoria

A GRATIFYING number of mammal species occur in the Loskop Dam Nature Reserve, including a variety of game animals.

Both chacma baboons (*Papio ursinus*) and vervet monkeys (*Cercopithecus aethiops*) are present in different parts of the reserve, including the densely forested hill bordering the dam, roughly opposite the dam wall, where both animals can on occasion be observed idly watching fishermen and tourists passing by in boats. The leopard (*Panthera pardus*), chief predator of the baboon, also survives, assured of a dependable food supply.

The delightful little night-ape (*Galago senegalensis moholi*) occurs in some parts, and at night its presence in thick bush is betrayed by the glow of its large eyes when a light is shone on them.

Of the insectivorous mammals the ones most likely to be encountered are the hedgehog (*Erinaceus frontalis*) and elephant shrews (*Elephantulus* sp. and possibly *Nasilio brachyrhynchus*), which can be seen during daytime scurrying around on rocky outcrops, in search of food. However, different species of the aggressive and voracious true shrews (*Crocidura* and *Suncus*) may also be met with, as well as the mounds of golden moles (e.g. *Amblysomus*). These differ from those of the rodent moles in that they are often connected by raised ridges of earth, formed when the animal burrows just below the ground surface.

There are comparatively few caves in the reserve. Visitors to these may nevertheless be rewarded by the sight of such cave bats as the horseshoe bats (*Rhinolophus* spp.), the Cape hairy bat (*Myotis tricolor*) and Schreiber's bat (*Miniopterus schreibersi*). House bats include the yellow house bat (*Scotophilus nigrita*) and various free-tailed bats of the genus *Tadarida*. Of the fruit bats the epauletted fruit bat (*Epomophorus* sp.) may be encountered, as well as, in summer, the migratory straw-coloured fruit bat (*Eidolon helvum*). The latter species ranges widely over Africa as a migrant and visits Southern Africa only in summer. Fruit-eating bats are much larger than the others here mentioned, which live on insects. Vampire bats, for which the fruit bats are sometimes mistaken by laymen, are related to the insect-eating bats. They occur only in South and Central America, and are small, relatively harmless animals.

Besides the leopard, a number of carnivores occur, the one most frequently encountered being the black-backed jackal (*Canis mesomelas*). This animal is present in fair numbers, and presents something of a threat to the game, owing to the fact that it sometimes kills young antelopes. The Cape fox (*Vulpes chama*) has not been reported, but has been encountered on the road not far away, and possibly also occurs in the reserve. This comparatively harmless little animal is sometimes blamed for the depredations of its more destructive cousin, the black-backed jackal, and persecuted for this reason, but it lives mainly on small mammals and birds, seldom molesting larger animals. The brown hyaena (*Hyaena brunnea*) is another resident of the reserve, where it " practises its trade " as scavenger. Its immensely dowerful jaws—stronger than those of the lion—enable it to crush the marrow bones of large antelopes.

Both the Cape polecat (*Ictonyx striatus*) and the white-naped weasel (*Poecilogale albinucha*) may be encountered, the first normally alone at night, the latter often in small groups in daytime. Both subsist on a diet of small mammals and birds. They are treated with reserve by experienced hunters, owing to the nauseating scent they secrete, and emit when alarmed.

The spotted-necked otter (*Lutra maculicollis*) and the clawless otter (*Aonyx capensis*) are both present, and signs of their presence may be found along quiet parts of rivers and streams. The civet (*Viverra civetta*) occurs in thick undergrowth, usually near water. One species of genet (*Genetta genetta*) has been found, as well as various species of mongoose, including the water mongoose (*Atilax paludinosus*), which is most commonly found along streams and rivers, where shelter is provided by riverine vegetation. The dwarf mongoose (*Helogale parvula*) may be encountered in small parties in dry bush.

The African wildcat (*Felis lybica cafra*) occurs in the reserve, as does the caracal lynx (*Felis caracal*), which is partial to hilly, boulder-strewn country, as is found over a large part of the area. The latter animal, like the black-backed jackal, is also prone to kill young antelopes.

Rock dassies (*Procavia capensis*) are infrequently encountered on rocky cliffs. Red hares (*Pronolagus* sp.) occur on rocky hillsides, where accumulations of their dung indicate their presence. The scrub hare (*Lepus saxatilis*) is quite common, and may be espied near dusk quite near the rest camp; in fact, one of these animals was seen repeatedly in the camp between dusk and early morning, moving casually around among the huts, nibbling at the lawns, evidently unalarmed at the proximity of human beings.

The aardvark (*Orycteropus afer*) lives in deep burrows in soft soil, from which it emerges only at night. It feeds on termites, and in order to capture its prey, breaks open termite mounds and inserts its long, sticky tongue into the passages. The termites stick to its tongue and are drawn into its mouth.

A variety of rodents occurs in the reserve. Most of these, however, are shy and inconspicuous nocturnal animals, and therefore unlikely to be often encountered by the casual visitor. The presence of mole-rats (*Cryptomys* sp.) is indicated by their mounds, which can be found in different parts of the reserve. Rock crevices and caves inhabited by porcupines (*Hystrix africaeaustralis*) usually have shedded quills lying around, and are often marked also by the presence of characteristically gnawed animal bones, which these animals carry to their lairs and hoard there.

Cane rats (*Thryonomys swinderianus*) are found in the dense vegetation along stream banks. The bush squirrel (*Paraxerus cepapi*) often inhabits hollow trees, in which it can find sanctuary when attacked. The forest dormouse (*Graphiurus murinus*) also inhabits hollow or rotten tree trunks, although it may also be found in rock crevices, and frequently enters houses or sheds, where it may be encountered in secluded nests made of rags, wool or paper.

Spring hares (*Pedetes capensis*) occur in the area, in burrows in sandy soil. At night, when they are active, they can be easily seen with the aid of a powerful torch or shooting lamp.

The red veld rat (*Aethomys chrysophilus*) is quite common, but owing to its nocturnal habits it is seldom encountered. It lives in sheltered bush or amongst rocks, nesting either in rock crevices or in underground burrows. The related Namaqua rock rat (*Aethomys namaquensis*) habitually occupies piles of rock or rock crevices, where it often co-exists with elephant shrews. Inhabited crevices are usually marked by the presence of wisps of straw, which are used to line the nest.

The Namaqua rock rat *Aethomys namaquensis*, one of the small mammals of the Loskop Dam Nature Reserve.

[Photo: J. Meester]

In well-marked tunnel-like runways amongst dense grass, in moist areas such as those found along stream banks, the four-striped mouse (*Rhabdomys pumilio*) and the vlei rat (*Otomys* sp.) may be found. These two animals very often occur together in this type of habitat, where the patient observer may be rewarded by seeing them dart around in daytime, along their maze of runways.

Game animals are fairly numerous, and as a result both of protecting existing stocks, and of reintroducing forms that have disappeared from here in the course of time, at present most of the species that could be expected in this type of country do in fact occur. A few possible exceptions include such animals as the eland (*Taurotragus oryx*) and the roan antelope (*Hippotragus equinus*). One male hippopotamus (*Hippopotamus amphibius*) remains, but is seldom seen. A single vaal rhebuck ram (*Pelea capreolus*) and three oribi ewes (*Ourebia ourebi*) were introduced, as these two species seem to have become extinct. These four animals have not been seen for some time, and it is not known whether they are still living in the reserve.

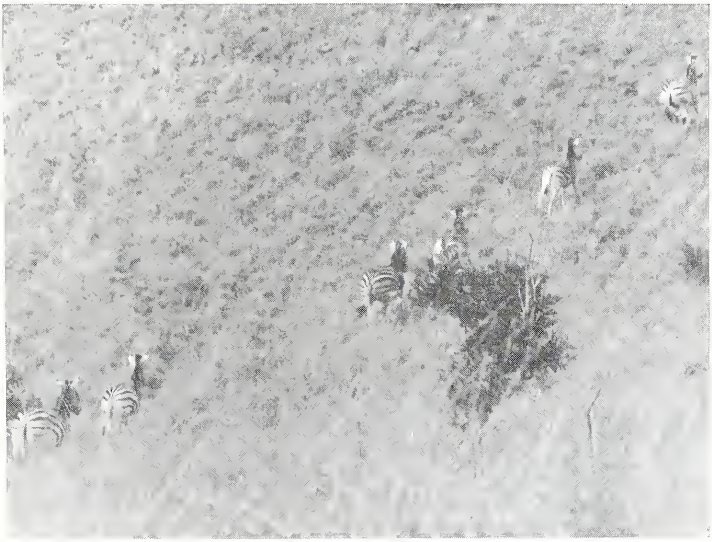
Steenbuck (*Raphicerus campestris*) and duiker (*Sylvicapra grimmia*) both survive in fair numbers, as well as a few klipspringer (*Oreotragus oreotragus*), usually found in rocky areas, where they clamber about with great agility, thanks to their specially modified hoofs, which allow them to move freely on most precarious footholds.

Redunca arundinum—Reedbuck ram.

[Photo: J. Meester]

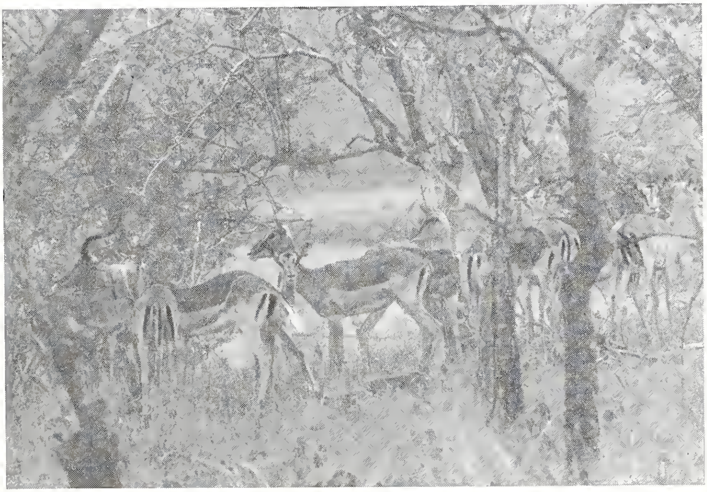
Connochaetes taurinus—Blue Wildebeest.

[Photo: J. Meester]



Equus burchelli antiquorum—Zebra.

[Photo: J. Meester]



Aepyceros melampus—Impala.

[Photo: J. Meester

Both reedbuck (*Redunca arundinum*) and mountain reedbuck (*R. fulvorufula*) are common, the former in the bush near the shores of the dam, the latter mainly on the rocky hillsides higher up. Other game animals to be seen include waterbuck (*Kobus ellipsiprymnus*), sable (*Hippotragus niger*), blue wildebeest (*Connochaetes taurinus*), zebra (*Equus burchelli antiquorum*) and kudu (*Tragelaphus strepsiceros*). Both bushbuck (*T. scriptus*) and nyala (*T. angasi*) occur—the latter introduced—although seldom seen, owing to their wary natures, and the nature of their habitat, consisting of dense thickets, where visibility is restricted.

The most common antelopes in the reserve are impala (*Aepyceros melampus*), of which there are several hundred, and blesbuck (*Damaliscus dorcas phillipsi*), whose numbers are approaching the hundred mark. While impala can be found in many parts of the reserve, blesbuck are for the most part confined to an open plain on the shores of the dam.

Damaliscus dorcas phillipsi—Blesbuck.

[Photo: J. Meester]

The following mammal species can be tentatively listed as occurring in the Loskop Dam Nature Reserve. The species marked with an asterisk (*) either have already been recorded, or are known with reasonable certainty to occur in the area; the others might possibly be present, although their presence has not been established:—

**Cercopithecus aethiops*—Vervet monkey.

**Papio ursinus*—Chacma baboon.

**Galago senegalensis moholi*—Night-ape.

Nasilio brachyrhynchus—Short-snouted elephant shrew.

**Elephantulus* sp.—Elephant shrew.

**Erinaceus frontalis*—Hedgehog.

Suncus etruscus—Dwarf shrew.

Crocidura hirta—Zambesi lesser red musk shrew.

**Crocidura cyanea infumata*—Reddish-grey musk shrew.

Crocidura bicolor—Tiny musk shrew.
Amblysomus hottentotus—Hottentot golden mole.
Bematiscus villosus—Rough-haired golden mole.
Eidolon helvum—Straw-coloured fruit bat (in summer).
Epomophorus sp.—Epauletted fruit bat.
Nycteris thebaica capensis—Slit-faced bat.
**Rhinolophus* spp.—Horseshoe bat.
Cloeotis percivalli—African trident bat.
Tadarida sp.—Freetailed bat.
Tadarida pumila elphicki—Little freetailed bat.
Platymops petrophilus—Flatheaded freetailed bat.
Myotis tricolor—Cape hairy bat.
Pipistrellus nanus—Banana bat.
Scotophilus nigrita—Yellow house bat.
Miniopterus schreibersi—Schreiber's bat.
Vulpes chama—Cape fox.
**Canis mesomelas*—Black-backed jackal.
**Ictonyx striatus*—Zorilla.
**Poecilogale albinucha*—White-naped weasel.
**Lutra maculicollis*—Spotted-necked otter.
**Aonyx capensis*—Clawless otter.
**Viverra civetta*—African civet.
**Genetta genetta*—Small-spotted genet.
Herpestes sanguineus—Slender mongoose.
**Atilax paludinosus*—Water mongoose.
**Helogale parvula*—Dwarf mongoose.
Ichneumia albicauda—White-tailed mongoose.
Cynictis penicillata—Yellow mongoose.
**Hyaena brunnea*—Brown hyaena.
**Felis lybica cafra*—African wildcat.
**Felis caracal*—Caracal lynx.
**Panthera pardus*—Leopard.
**Orycteropus afer*—Aardvark.
**Procavia capensis*—Dassie.
**Equus burchelli antiquorum*—Chapman's zebra.
**Hippopotamus amphibius*—Hippopotamus.
**Sylvicapra grimmia*—Grey duiker.
**Raphicerus campestris*—Steenbok.
Ourebia ourebi—Oribi.
**Oreotragus oreotragus*—Klipsringer.
Pelea capreolus—Vaal rhebok.
**Redunca fulvorufula*—Mountain reedbuck.

***Redunca arundinum*—Reedbuck.
**Kobus ellipsiprymnus*—Waterbuck.
**Aepyceros melampus*—Impala.
**Hippotragus niger*—Sable antelope.
**Damaliscus dorcas phillipsi*—Blesbok.
**Connochaetes taurinus*—Blue wildebeest.
**Tragelaphus scriptus*—Bushbuck.
**Tragelaphus angasi*—Nyala.
**Tragelaphus strepsiceros*—Kudu.
**Lepus saxatilis*—Scrub hare.
**Pronolagus* sp.—Red hare.
**Cryptomys* sp.—Mole-rat.
**Hystrix africaeaustralis*—Porcupine.
**Thryonomys swinderianus*—Great cane-rat.
**Paraxerus cepapi*—Bush squirrel.
Pedetes capensis—Spring hare.
**Graphiurus murinus*—Forest dormouse.
Graphiurus platyops—Rock dormouse.
**Aethomys chrysophilus*—Red veld rat.
**Aethomys namaquensis*—Namaqua rock rat.
Thallomys paedulcus—Black-tailed tree rat.
Mastomys natalensis—Multimammate mouse.
**Rhabdomys pumilio*—Four-striped mouse.
Mus minutoides—Pygmy mouse.
Dasymys incomtus—African water rat.
Lemniscomys griselda—Single-striped grass rat.
Saccostomus campestris—Pouched mouse.
Steatomys pratensis—Fat mouse.
Dendromus melanotis—Grey pygmy tree-mouse.
**Otomys* sp.—Vlei rat.

STONE AGE REMAINS IN THE LOSKOP DAM NATURE RESERVE

By **B. D. Malan,**

Director, Archaeological Survey, Johannesburg

THERE is abundant evidence that primitive men of the Stone Age lived along the banks of the Olifants River and its tributary streams in the area which is now included in the Reserve. Anyone who is able to recognize the artefacts of these early men cannot walk far without finding the tools and flakes these people left in their tracks. Indeed, it is clear that the area must have held great attractions for people of the Stone Age. This we can easily understand, for the area offered in great abundance the essential needs for human existence: water, food and suitable stone for making the tools without which man could not have survived.

In spite of these attractions, the earliest tools found up to now represent a stage when human material culture had already made considerable advances up the scale of progress. They belong to a stage which has been called after the little town of Fauresmith in the Orange Free State from where similar relics were first described. Although this Fauresmith Culture flourished more than 50,000 years ago, it developed only after man had been making stone tools for at least ten times that period, slowly but surely discovering progressive improvements and more efficient techniques of making them. We have every reason to expect that tools of these earlier people will yet be found in the Loskop area, for we have evidence of their presence in gravels of the Olifants River not many miles away.

A pleasant stroll along the edge of the dam below and beyond the swimming bath takes us across an area where people who enjoyed the Fauresmith Culture camped, leaving behind them their stone tools and the waste flakes and cores produced in making them. This was therefore clearly not only a place where they lived, but where they also made their implements. Although these people sometimes lived in caves, they were equally at home in open camps which they commonly occupied along river banks where they could obtain water for themselves and where the animals on which they depended for food could be killed when they came to drink.

In due course the people who enjoyed the Fauresmith Culture disappeared. From evidence found elsewhere, it seems they may have been forced to leave because the country suffered a long period during which rainfall decreased to such an extent that it could no longer support human life. It was only after 20,000 years or more that man re-appeared in the area. The newcomers belonged to what archaeologists call the Middle Stone Age, a period which lasted from about 30,000 to 10,000 years ago. By this time man in South Africa had made great cultural strides. He now made a far greater variety of tool types and had discovered the advantages of fitting some of them to shafts to provide spears or lances. They could therefore hunt more efficiently than their predecessors whose implements were essentially hand tools and who probably relied largely on traps for hunting. These Middle Stone Age men made smaller and lighter

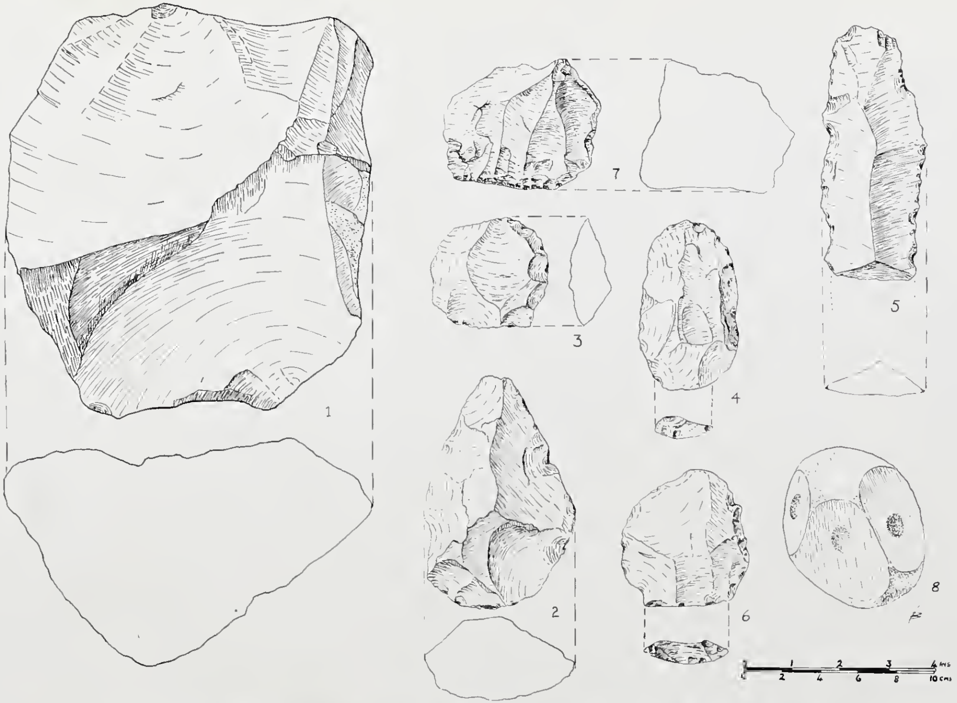


FIG. 1.—1 and 2: Fauresmith core and handaxe. 3 to 6: Middle Stone Age core, scraper, blade and flake. 7 and 8: Later Stone Age scraper and grindstone.

implements and developed better techniques of making them. They seem to have preferred the open plains to more mountainous country. Their tools and flakes lie scattered in great numbers on the Springbok Flats, but in the Reserve only sparse evidence of their penetration into the mountains has so far been found.

In due course the Middle Stone Age people also disappeared and were followed by Later Stone Age people who included the nomadic Bushmen hunters. In contrast with the Middle Stone Age people whose artefacts are abundant in the Transvaal, the Later Stone Age occupation of the Province was not intense, for sites which yield their artefacts are far less common. Two very typical tools, a heavy scraper and a grindstone found on the slopes of dongas in the area known as " Wildvreet " across the river from the huts prove that Later Stone Age hunters at least wandered into the area of the Reserve in the course of their hunting.

The last people to occupy the area before the arrival of Europeans were, of course, the Bantu. They have left interesting signs of their occupation in the form of ruins of huts which may be seen in the " Wildvreet " area, though there is no evidence of the date of these ruins and they may be as late as the European occupation.

High up in a wild kloof on the far side of the dam from the camp is a large rock shelter formed by overhanging rocks. On the back wall of this shelter there are a number of paintings, the majority of a greyish-white colour. They are exceedingly crude and appear to have been drawn with fingers dipped in paint. Apart from a few human and animal figures, the majority of paintings depict covered and open wagons drawn by oxen and led by a leader or " touleier ". The wagons are shown in side-view without any attempt at perspective, the trek chain is represented by a single line and the oxen merely by short lines drawn across this. In one of the wagons there is an attempt to show two people inside it. Interesting, too, are two pictures in the same crude style of men riding horses. The content of these paintings clearly show that they were done after Eruopeans had entered the area. One very fresh painting of a wagon and oxen is probably the modern work of a herdboy. This is a valuable clue for it indicates that the older paintings are almost certainly also Bantu work and that the other paintings in the cave which are much more faded must be appreciably older than the modern imitation. Paintings similar to these in style and content have been found in the Witbank district.

The discoveries made so far are the result of a very superficial exploration of the Reserve. However, enough has been found to show that the area is of considerable interest for the archaeologist. There is no doubt that much more will yet be discovered.

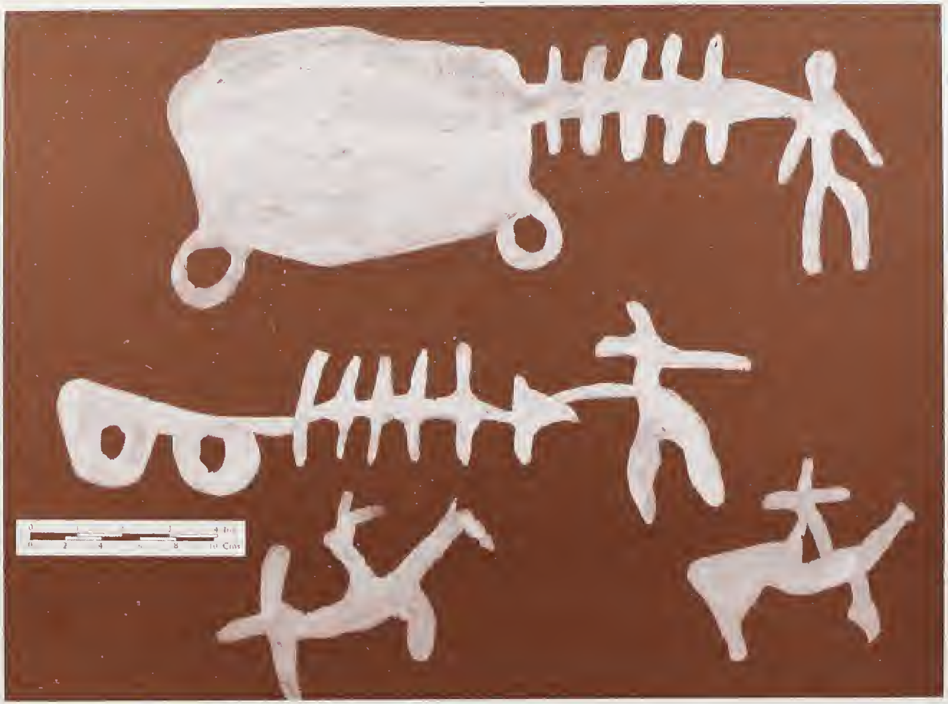
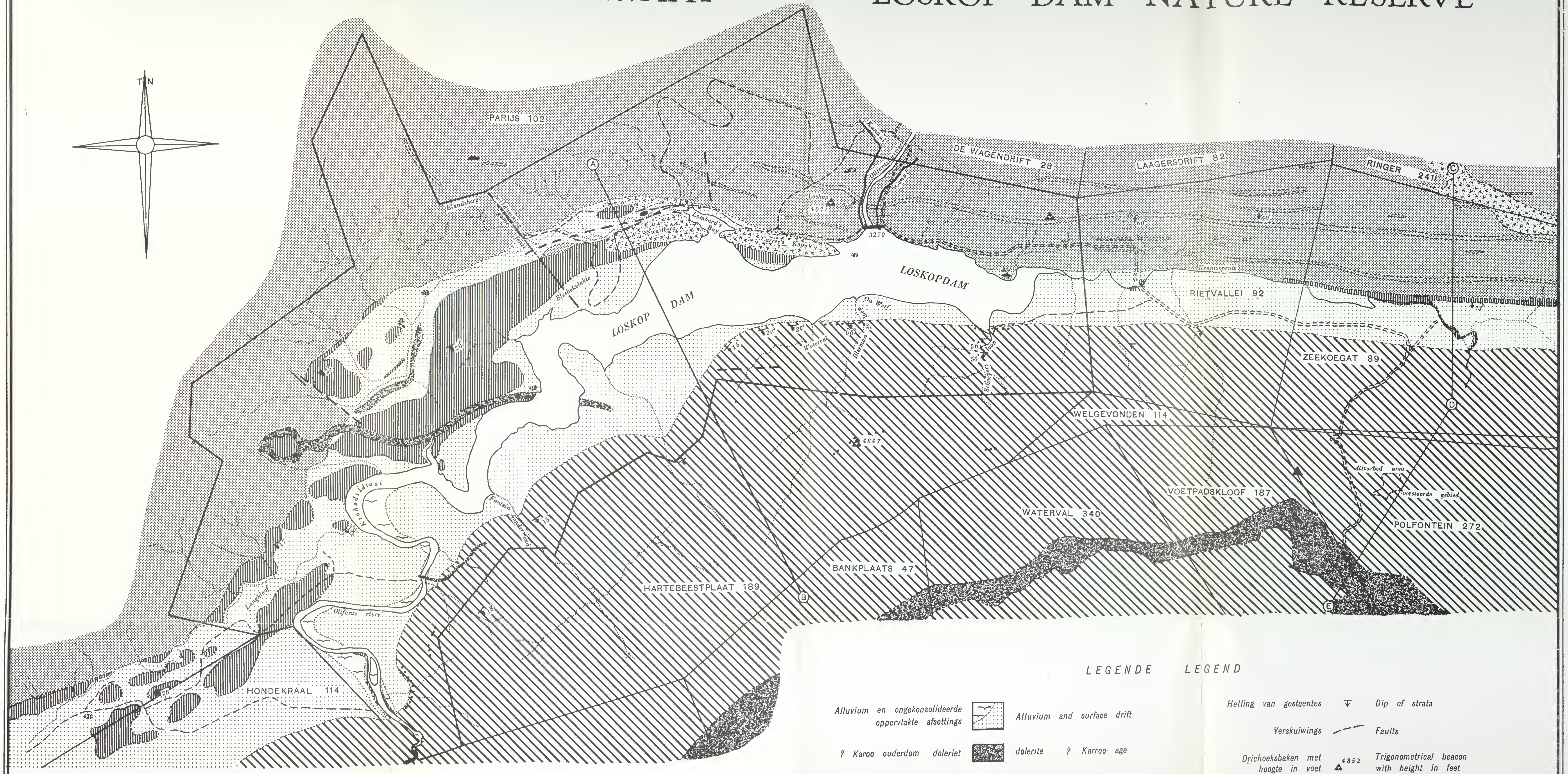


FIG. 2.—Bantu paintings of wagons and horsemen in a rock shelter in the Loskop Reserve. (The figures have been re-arranged.).

GEOLOGIESE KAART VAN DIE LOSKOPDAM — NATUURRESERVAAT

GEOLOGICAL MAP OF THE LOSKOP DAM NATURE RESERVE



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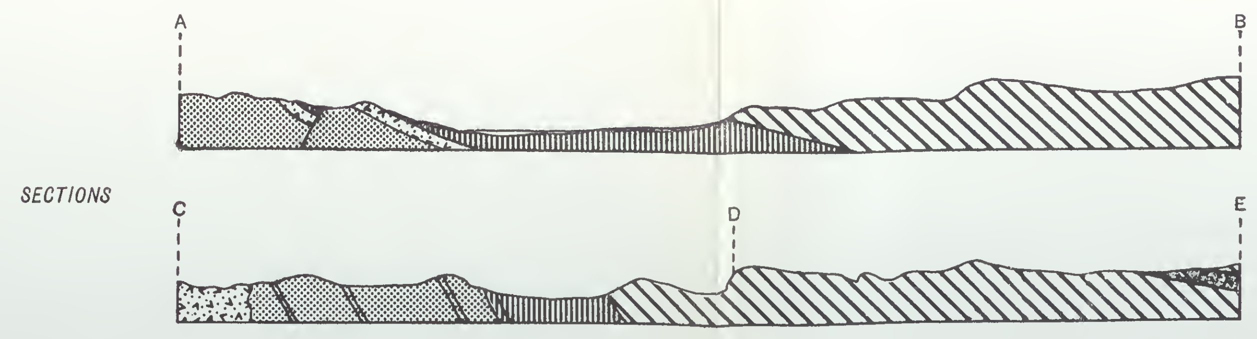

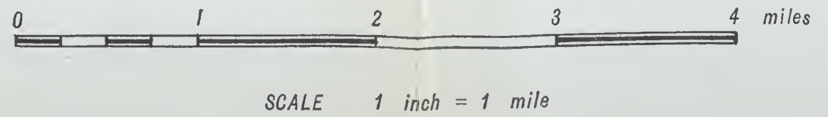

SCALE 1 inch = 1 mile

LEGENDE LEGEND

Alluvium en ongekonsolideerde oppervlakte afsettings		░	Alluvium and surface drift	
? Karoo ouderdom doleriet		▓	dolerite ? Karroo age	
SISTEEM WATERBERG	sandsteen, kwartsiet, skalie, konglomeraat	▧	sandstone, quartzite, shale, conglomerate	WATERBERG SYSTEM
SISTEEM LOSKOP	skalie, sandsteen, kwartsiet, konglomeraat	▥	shale, sandstone, quartzite, conglomerate	LOSKOP SYSTEM
	granietporfier	▒	granite porphyry	
Rooibergfelsiet met tussengelaagde sedimente en piroklaste		▦	Rooiberg felsite with interbedded sediments and pyroclastic rocks	

Helling van gesteentes	⊤	Dip of strata
Verskuiwings	– —	Faults
Driehoeksbaken met hoogte in voet	▲ 4852	Trigonometrical beacon with height in feet
Hoogte in voet	▪ 3270	Spot heights in feet
Hoof en ondergeskikte paaie	═	Roads and tracks
Riviere, spruite en slote	≈	Rivers, streams and gulleys
Besproeiingskanaal	━	Irrigation canal
Grens van Reservaat	∧	Reserve boundary
Plaas grense	∨	Farm boundaries
Ruskamp	⌂	Rest camp

Based on survey by L. Wolhuter and drawn by J.H. Cowin

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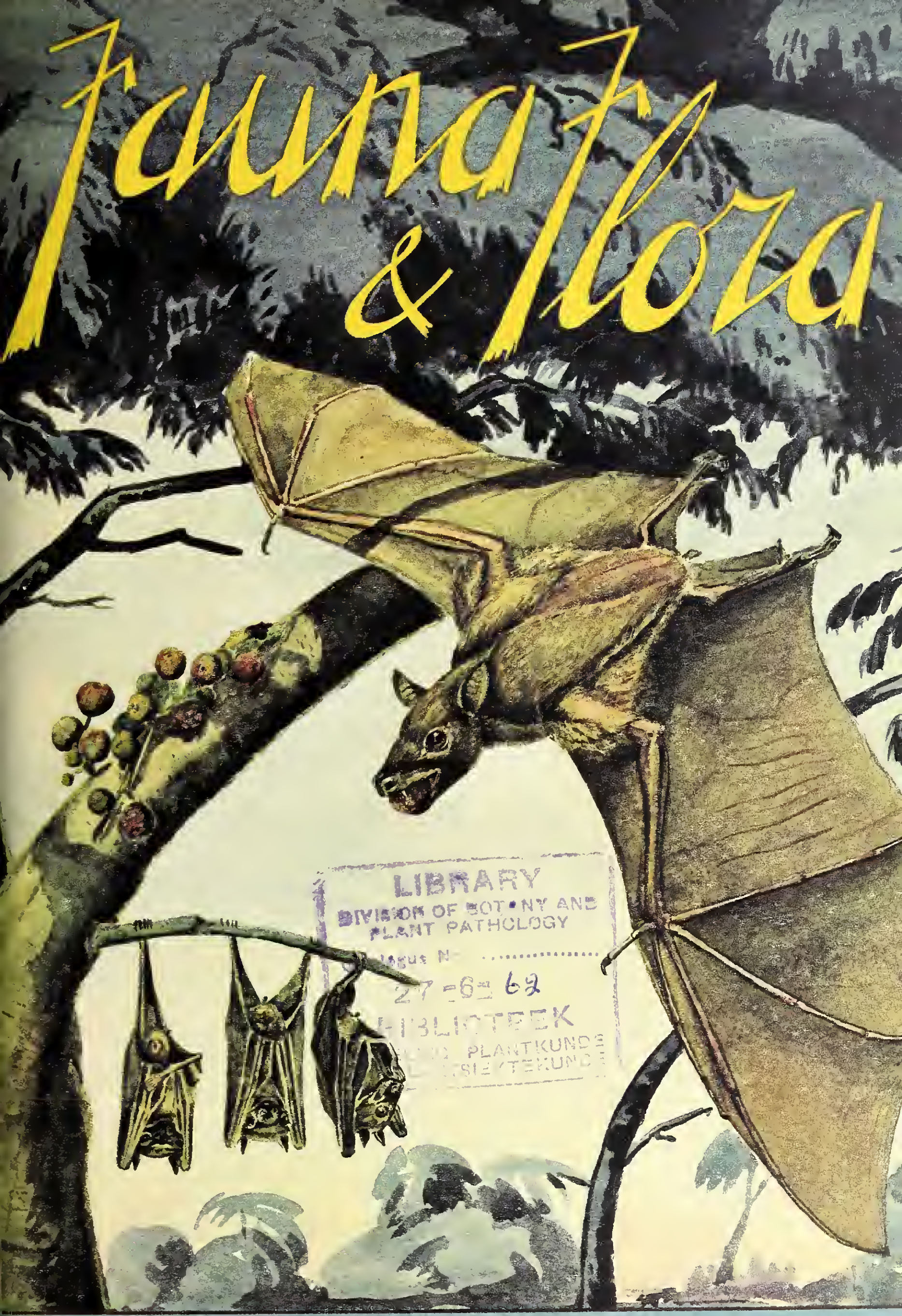
Fauna & Flora



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(Foto/Photo: W. F. Schack.)

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ADMINISTRASIE VAN DIE PROVINSIE VAN TRANSVAAL

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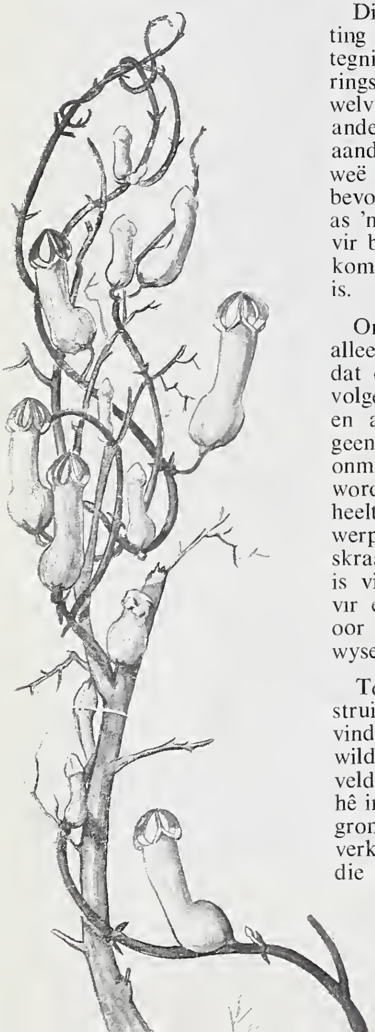
PLAASBEPLANNING EN NATUURBEWARING

T. J. Steyn

Direkteur van Natuurbewaring

VIR meer as 'n dekade en met elke middel tot sy beskikking het die Transvaalse Afdeling Natuurbewaring, net soos sy susterorganisasies in die ander Provinsies, belangstelling in sy eie werk bevorder. Dit is dus verblydend om te sien dat dié belangstelling nie alleen onder die algemene publiek nie, maar selfs tot verskeie Staatsdepartemente gesprei het. Een hiervan is die Departement van Landboutegniese Dienste.



Die Afdeling Grondbewaring en Voorligting van die Departement van Landboutegniese Dienste het onlangs 'n natuurbewaringsprojek aangekondig waarvolgens die welvaart van wild, voëls, vis en flora onder andere tydens plaasbeplanning die nodige aandag sal ontvang. Hierdie stap word allerweë verwelkom omdat die versuim om die bevordering van wild, voëls, vis en wilde plante as 'n wettige vorm van grondgebruik te erken, vir baie jare as een van die vernaamste tekortkomings van die Grondbewaringswet beskou is.

Ons hoop dat hierdie tekortkoming nie alleen binnekort reggestel sal word nie, maar dat die Departement sal voortgaan om grond volgens vermoë te klassifiseer (soos in Amerika en ander vooruitstrewende lande) sodat van geen stuk grond verwag sal word om die onmoontlike te verrig nie. Dit kan nie betwis word dat groot dele van ons land tans aan heeltemal onvanpaste boerderymetodes onderwerp word nie, en dat baie van die betrokke skraal gronde op die lang duur meer geskik is vir die produksie van wild, voëls, ens. as vir enige ander doel. Die onlangse droogtes oor wydverspreide gebiede het hierdie sienswyse weereens bevestig.

Tot dusver het die Provinsies 'n ernstige struikelblok in hul natuurbewaringswerk ondervind: van hulle is verwag om die wild, wilde voëls, flora, ens. as eindprodukte van die veld te bestuur sonder om enige seggenskap te hê in die hantering van die basiese bronne, soos grond en water, waaruit daardie produkte verkry word. Deur noue samewerking tussen die Provinsies en die Afdeling Grondbewaring en Voorligting kan hierdie leemte nou oorbrug word. Daar is byvoorbeeld reeds ooreengekom dat die Provinsiale afdelings vir Natuurbewaring voortaan

FARM PLANNING AND NATURE CONSERVATION

T. J. Steyn

Director of Nature Conservation

FOR more than a decade, and by every means at its disposal, the Nature Conservation Section of the Transvaal, like its sister organizations in other Provinces, has been promoting interest in its own work. It is gratifying, therefore, to find that such interest has spread, not only amongst the general public, but also to several Government Departments. One of the latter is the Department of Agricultural Technical Services.

The Division of Soil Conservation and Extension has recently announced a nature conservation project whereby, *inter alia* wildlife interests will receive due consideration in future farm planning. This development must be welcomed since the Soil Conservation Act's failure to recognize wildlife promotion as a legitimate form of land-use has for many years been considered one of the main shortcomings of that Act.

It is hoped not only that this defect will be rectified in the near future, but also that the Department will proceed to adopt a system of land capability classification (as in America and other progressive countries) whereby no stretch of land will be expected to achieve the impossible. It cannot be denied that large tracts of our country are presently being subjected to totally unsuitable farming practices, and that on a long-term basis much of the marginal and submarginal land involved is indisputably more suitable for wildlife production than for any other purpose. The recent droughts in widespread areas have endorsed this view once more.

Up to the present, the Provinces suffered a serious handicap in their nature conservation activities: they were expected to manage game, wildfowl, flora, etc., as the final products of the land, but had no say in the manipulation of the basic resources, such as soil and water, from which these products were derived. This inability can now be eliminated through close co-operation between the Provinces and the Division of Soil Conservation and Extension. Thus it has been agreed, for instance, that the Provincial Conservation Departments will be consulted in the earliest stages of future farm planning. Details concerning subjects such as wildlife habitat improvement, the use of waste lands, the construction of fish ponds, the establishment of live fences, the promotion of waterfowl and the supply of suitable game species will be given free of charge to interested farmers. It is further anticipated that the improvements mentioned will eventually qualify for the subsidies normally available under the Soil Conservation Act.

As far as the Transvaal is concerned, these developments happily coincide with a new approach to nature conservation. The emphasis has already shifted from the law enforcement duties of the former " Inspectors of Fauna and Flora " to the technical information and extension functions of the present " Nature Conservation Officers ". These officers will naturally work in close collaboration with our professional staff and with our new Education and Extension Section.

in die vroegste stadia van plaasbeplanning geraadpleeg sal word. Aan belangstellende boere sal inligting gratis verstrek word oor onderwerpe soos verbetering van die habitat van wild en voëls, die gebruik van uitvalgronde, die bou van visdamme, die vestiging van „ lewende " heinings, die bevordering van watervoëls en die verskaffing van geskikte wildsoorte. Die verwagting word verder gekoester dat genoemde verbeterings uiteindelik sal kwalifiseer vir die normale subsidies wat onder die Grondbewaringswet beskikbaar is.

Sover dit Transvaal betref, val hierdie ontwikkelings gelukkig saam met 'n nuwe benadering tot natuurbewaring. Die klem het reeds verskuif van die wetstoepassingspligte van die vorige „ Inspekteurs van Fauna en Flora " na die tegniese inligtings- en voorligtingsfunksies van die huidige „ Natuurbewaringsbeamptes ". Hierdie beamptes sal natuurlik in noue samewerking met ons vakkundige personeel en ons nuwe Opvoedkundige en Voorligtingsseksie werk.

Klaarblyklik sal hierdie verskuiwing van nadruk groter aandag vereis aan navorsing oor fauna en flora, wat die enigste gesonde basis vir natuurbewaring bied. Dit word in ons land nog nie voldoende besef dat bewaringspogings wat nie op wetenskaplike gegewens gegrond is nie, nie alleen 'n onsekere dobbelspel is nie, maar selfs uiters skadelik mag wees. Die resultaat is dikwels presies die teenoorgestelde van die doelwit.

Ons maak nie daarop aanspraak om oor al die antwoorde op bewaringsprobleme te beskik nie. Inderdaad het ons baie min. Juis daarom is die behoefte aan navorsing so groot.

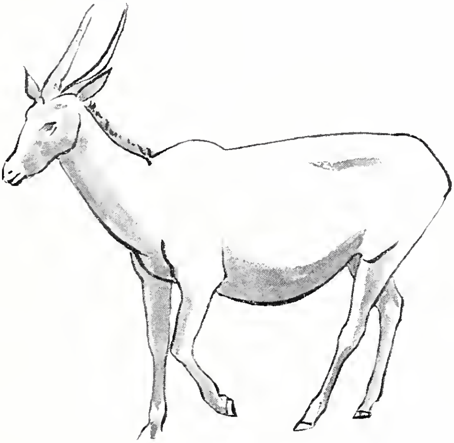
Miskien is hierdie die geleë tydstip om in 'n ander verband 'n woordjie van waarskywing te lug: mens moet versigtig wees om in die nuwe vloedgolf van geesdrif nie die bestaande wetgewings en prosedures oor die hoof te sien nie. In terme van die Uniewet het die Provinsies vir baie jare sake soos die jag, vang, verkoop, vervoer, invoer en uitvoer van wild en verskeie ander vorms van natuurlewe beheer. Onder ons huidige grondwet is die bewaring van fauna en flora nog steeds 'n funksie van die Provinsiale Administrasies. Met verloop van tyd is 'n aansienlike hoeveelheid wetgewing oor hierdie onderwerp op die wetboek geplaas, en dit is nog ten volle van krag.

Ten slotte wil ek die Departement van Landbou-tegniese Dienste gelukwens met die rigting wat ingeslaan is en al ons hulp aanbied in die gemeenskaplike belang van al die mense, diere en blomme van ons mooi land, die Republiek van Suid-Afrika.

Obviously this shift of emphasis will necessitate more attention to wildlife research, the only sound basis for nature conservation. It is not sufficiently realized in this country that conservation efforts based on anything but scientific data are not only an uncertain gamble, but may even be extremely harmful. The results often are the very opposite of the aims.

We do not claim to have all the answers to conservation problems. In fact, we have very few. On the other hand, if we did have all the answers, then the crying need for research would have fallen away.

This may be an opportune moment to sound another note of warning: people should not allow themselves to be swept away by the new wave of enthusiasm to the extent of overlooking existing legislation and procedure. In terms of the Act of Union, the Provinces have for many years controlled matters such as the hunting, capture, sale, transport, import and export of game and various other forms of wildlife. Under our present constitution, the conservation of fauna and flora continues to be a function of the Provincial Administrations. Through the years, a great body of statutory law on this subject has come into being, and that is still in force.



In conclusion I wish to congratulate the Department of Agricultural Technical Services on the steps taken, and to offer all our help in the common interest of all the people, the beasts and the flowers of our fair land, the Republic of South Africa.

HOE GROOT IS DIE WERPSEL VAN DIE WILDEHOND *Lycaon pictus* (Temminck) ?

R. Bigalke

TEN spyte van die feit dat die Wildehond (*Lycaon pictus*) 'n bekende en vrugbare laeveldse soogdier is, is daar nog heelwat onsekerheid oor die grootte van sy werpsels.

Volgens Sclater (⁷) het Smuts beweer dat 'n werpsel uit 10-12 hondjies bestaan, en dat die tewe hulle kleintjies in groot gate in die ope veld in die wêreld bring.

Hamilton (¹⁰) skryf dat dit skyn asof die kleintjies in Suid-oos Afrika gedurende die maande Maart tot September gebore word en wel gewoonlik in Junie. In 'n vroeëre berig (⁹) sê hy egter dat dit skyn asof hulle meesal in April gebore word. Hy maak ook melding van 'n geval waar twee hondjies wat amper ryp vir geboorte was in die maand Desember in 'n teef gevind is. Hy beklemtoon ook die feit dat die getal hondjies in 'n werpsel varieer. In afsonderlike gevalle het hy twee of drie welpies met 'n enkele teef waargeneem, en hy is van mening dat 'n werpsel in die veld uit twee tot ses hondjies bestaan, maar dat ses waarskynlik 'n uitsondering is. Hamilton beklemtoon ook dat die groot getal kleintjies wat 'n mens dikwels in een gat kry te wyte is aan die feit dat verskillende tewe gelyktydig van die gat gebruik maak. Dit is juis om hierdie rede dat dit moeilik of onmoontlik is om noukeurig vas te stel hoeveel hondjies daar in werpsels buite in die natuur gebore word. Die halfgroot hondjies wat 'n mens saam met enkele tewe in die veld kry is geen betroubare leidraad nie, want Hamilton self maak melding van die feit dat die kleintjies aan 'n hoë sterftesyfer onderhewig is (⁹) en (¹⁰).

Vaughan Kirby (⁴) het tweemaal 'n werpsel van vier, eenmaal van ses en eenmaal van agt gesien. Volgens sy naturelle was die gat in die laasgenoemde geval deur twee tewe bewoon.

Onlangs het van der Merwe (¹¹) ons kennis van hierdie wildehond opgesom. Hy beweer dat 'n werpsel gewoonlik uit 2 tot 6 hondjies bestaan, maar dat daar dikwels van 10-12 van verskillende moeders in dieselfde gat gevind word. Op grond van die teelresultate van die Nasionale Dieretuin (²) gee hy te kenne dat daar in gevangeskap tot 12 hondjies in 'n werpsel mag wees.

In die nuutste bydrae, dié van Ansell (¹), word berig dat die getal kleintjies met geboorte van 2 tot 8 varieer, en dat die teef 6 of 7 paar spene het.

Die enigste betroubare metode om vas te stel hoeveel kleintjies 'n wildehond kry is om hulle in gevangeskap te teel, waar deeglike waarnemings oor teelpare gemaak kan word.

THE SIZE OF THE LITTER OF THE WILD DOG
Lycaon pictus (Temminck)

R. Bigalke

ALTHOUGH the wild Dog (*Lycaon pictus*) is a well-known member of the fauna of the lowveld and a prolific breeder, there is still uncertainty about the size of its litters.

Sclater (7) cites Smuts as stating that there are 10-12 pups at birth and that the females bring forth their young in large holes or earths on the open plains.

Hamilton (10) states that the young seem to be born in South-east Africa from March to September and that the favourite month appears to be June. In the earlier account (9) he says that April seems to be the favourite month. He also records a case in which two pups almost ready for birth were found in a female in December. Hamilton draws attention to the fact that the number of pups in a litter is variable. He has seen two or three following single females on separate occasions and is of the opinion that two to six is the complement of a litter in the bush, though six is probably the exception. He also points out that the large number of pups often found in one burrow is due to the fact that several females use it at the same time. It is this habit that makes it difficult if not

In die Nasionale Dieretuin is die volgende werpsels in die jare 1929-60 gebore:

TABEL 1.

	Geboortedatum.	*Getal hondjies in die werpsel.*
(*a*)	5 Oktober 1929	8
(*b*)	21 April 1931	8
(*c*)	30 November 1931	9
(*d*)	11 Mei 1935	2
(*e*)	11 April 1936	7
(*f*)	22 Maart 1937	7
(*g*)	19 Oktober 1937	3
(*h*)	7 April 1939	7
(*i*)	3 Mei 1939	7
(*j*)	9 Junie 1942	10
(*k*)	24 Mei 1943	12
(*l*)	10 Junie 1944	11
*(*m*)	10 April 1959	10
*(*n*)	18 November 1959	6
*(*o*)	9 Augustus 1960	10 (doodgebore).

Getal Werpsels: 15. Getal Hondjies: 117.

* Werpsels (*m*), (*n*), en (*o*) is van dieselfde ouers.

Die frekwensie van die werpselgroottes is soos volg:—

TABEL 2.

Twee hondjies in 'n werpsel	Eenmaal.
Drie hondjies in 'n werpsel	Eenmaal.
Ses hondjies in 'n werpsel	Eenmaal.
Sewe hondjies in 'n werpsel	Viermaal.
Agt hondjies in 'n werpsel	Tweemaal.
Nege hondjies in 'n werpsel	Eenmaal.
Tien hondjies in 'n werpsel	Driemaal.
Elf hondjies in 'n werpsel	Eenmaal.
Twaalf hondjies in 'n werpsel	Eenmaal.

Die volgende tabel wys hoe die werpsels oor die verskillende maande van 'n jaar verdeel is:—

TABEL 3.

Maand.	*Getal Werpsels.*
Maart	Een.
April	Vier.
Mei	Drie.
Junie	Twee.
Augustus	Een.
Oktober	Twee.
November	Twee.

Die teef is goed toegerus vir groot werpsels. Die moeder van werpsels (*m*), (*n*) en (*o*) in tabel 1 het twaalf spene; dit stem ooreen met Ansell se waarnemings dat daar ses of sewe pare is (1).

As die kleintjies op 'n ouderdom van ongeveer ses weke van die moeder weggeneem word, is dit moontlik om twee of selfs drie werpsels van haar in een jaar in 'n dieretuin te teel. Dit was inderdaad die geval met die werpsels (*m*) en (*n*) in tabel 1, wat albei van dieselfde ouers is; waarskynlik geld dit ook vir werpsels (*b*) en (*c*). In die geval van die leeu is dit ook moontlik om twee of drie werpsels per jaar in 'n dieretuin te teel, as die welpies op die ouderdom van ongeveer ses weke van die moeder weggeneem word.

impossible to determine with any degree of accuracy the number of pups born in litters out in the veld. The larger pups that follow single females are not a safe guide, since Hamilton himself says that infant mortality is considerable (9) and (10).

Vaughan Kirby (4) has twice seen a litter of four, once of six and once of eight. His natives assured him that in the latter case the hole was occupied by two bitches.

In a recent paper in which van der Merwe (11) summarises our knowledge of this dog, he says that a litter usually consists of 2-6 pups but frequently 10-12 from different mothers are found in one burrow. Based on the records of the National Zoological Gardens (2), he states that in captivity up to 12 pups are born in a litter.

In the most recent account by Ansell (1), it is stated that the number of pups at birth is 2 to 8 and that the female has 6 or 7 pairs of teats.

The only reliable method of determining the number of pups in the litters is to study the breeding of wild dogs in captivity, where pairs can be kept under proper observation.

The following litters have been born in the National Zoological Gardens between the years 1929 and 1960:—

TABLE No. 1.

	Date of Birth.	*Number of Pups in Litter.*
(*a*)	5 October, 1929	8
(*b*)	21 April, 1931	8
(*c*)	30 November, 1931	9
(*d*)	11 May, 1935	2
(*e*)	11 April, 1936	7
(*f*)	22 March, 1937	7
(*g*)	19 October, 1937	3
(*h*)	7 April, 1939	7
(*i*)	3 May, 1939	7
(*j*)	9 June, 1942	10
(*k*)	24 May, 1943	12
(*l*)	10 June, 1944	11
*(*m*)	10 April, 1959	10
*(*n*)	18 November, 1959	6
*(*o*)	9 August, 1960	10 (Still-born).

Total number of litters: 15. Total number of pups: 117.

* Litters (*m*), (*n*) and (*o*) are from the same parents.

The frequency of the sizes of the litters is as follows:—

TABLE No. 2.

Two pups in a litter	Once.
Three pups in a litter	Once.
Six pups in a litter	Once.
Seven pups in a litter	Four times.
Eight pups in a litter	Twice.
Nine pups in a litter	Once.
Ten pups in a litter	Three times.
Eleven pups in a litter	Once.
Twelve pups in a litter	Once.

(Foto/Photo: Chris Pisart.)

Jong wildehonde in die Nasionale Dieretuin, Pretoria.
Young wild dogs in the National Zoological Gardens, Pretoria.

Steyn (8) het beklemtoon dat die werpselgrootte van leeuwyfies onder andere ook deur hulle ouderdom beïnvloed word, en dat die eerste en laaste paar werpsels dikwels klein is. Dit mag om hierdie rede wees dat werpsel (*d*) in tabel 1 slegs uit twee en werpsel (*g*) uit drie hondjies bestaan het. Dit is ook moontlik dat die moeders sommige hondjies opgeëet het voordat hulle deur die opsigter getel is. Tewe het 'n neiging om so te reageer as hulle gesteur word of die kleintjies doodgebore word.

As 'n mens om bogenoemde rede die twee November werpsels nie in ag neem nie, dan blyk dit dat daar dertien werpsels in die maande Maart tot Junie, Augustus en Oktober in die Nasionale Dieretuin gebore is. Dit verskil nie veel van wat Hamilton in die laeveld waargeneem het nie.

Van die vyftien werpsels wat in die Nasionale Dieretuin gebore is het vier uit sewe hondjies bestaan en die gemiddelde getal van al vyftien was amper 8 (7·8). Uit tabel 2 is dit duidelik dat werpsels van agt of meer glad nie seldsaam is nie. Hamilton is sonder twyfel reg as hy beweer dat daar 'n hoë sterftesyfer van jong hondjies in die natuur is, maar sy syfer van 2 - 6 by geboorte kan nie meer aanvaar word nie. Dat die getal hondjies varieer is duidelik uit tabel 1, wat ook wys dat die getal van 2 tot 12 per werpsel varieer met 'n gemiddelde van 7.

Die getal kleintjies by geboorte wys dat die wildehond 'n vrugbare dier is, en dit suggereer onmiddellik 'n hoë sterftesyfer vir die kleintjies. In sy verwysing na hierdie verskynsel meen Hamilton (9) en (10) dat ingewandsinflammasie (enteritis?) die oorsaak daarvan is. In die jaar 1938 het Neitz en Thomas(6) gevind dat 'n bloedparasiet *Rickettsia canis* verantwoordelik was vir swaar verliese onder huishonde in die suidelike

In the following table the distribution of the litters over the various months of the year is shown:—

TABLE No. 3.

Month.	*Number of Litters.*
March	One.
April	Four.
May	Three.
June	Two.
August	One.
October	Two.
November	Two.

The female wild dog is well equipped for large litters. The mother of litters (*m*), (*n*) and (*o*) above has 12 teats, which agrees with Ansell's observations that there are either 6 or 7 pairs (1).

If the pups are taken away from the mother at the age of about six weeks, it is possible to breed two or even three litters from her in a year in a zoological garden. This actually happened in the case of litters (*m*) and (*n*) in table No. 1., both of which had the same parents; the same probably also holds good for litters (*b*) and (*c*). In the case of a lion it is also possible to get two or three litters per year in a zoo if the cubs are taken from the mother at the age of about six weeks.

Steyn (8) has emphasised that the size of the litter of lionesses is affected among other factors by the age of the females, and the first and last few litters are often small. This may also explain the fact that litter (*d*) in table No. 1 consisted of only two and litter (*g*) of three pups. It is possible, also, that the mothers had devoured some of the pups before they were counted by the attendant. Bitches are liable to do this if they are disturbed or if pups are still-born.

If the two litters born in November are ignored for the reason given above, it transpires that in the National Zoological Gardens thirteen litters were born in the months of March to June, August and October. This is not very different from what Hamilton found in the lowveld.

Four of the fifteen litters bred in the National Zoological Gardens consisted of seven pups and the average for all fifteen is nearly 8 (7·8). It is clear from table No. 2 that litters of 8 and more are by no means rare. Hamilton is no doubt correct in stating that the mortality of young pups in the veld is heavy, but his figure of 2-6 pups per birth can no longer be accepted. That the litters vary in numbers is obvious from table No. 1, from which it is also clear that they vary from 2 to 12 pups per litter with an average of 7.

The number of pups at birth shows that the wild dog is a prolific breeder and this immediately suggests a high rate of infant mortality. In referring to this, Hamilton (9) and (10) suggests that "intestinal inflammation" (enteritis?) may be the reason. In the year 1938 Neitz and Thomas (6) found that a blood parasite *Rickettsia canis* was responsible for the loss of many domesticated dogs in the southern part of the Kruger Park.

deel van die Kruger-wildtuin. Op grond van hulle ondersoek het hulle ook tot die slotsom gekom dat dieselfde parasiet miskien ook verantwoordelik was vir 'n groot vermindering in die wildehond populasie in die Kruger-wildtuin ten suide van die Olifantsrivier.

Die huishond is ook 'n vrugbare dier en daar mag gemeld word dat 'n teef van vier tot ses paar spene het met 'n gemiddelde van vyf paar. Die kleiner rasse het minder spene en soms is daar ook 'n ongelyke getal (Verw. 5). Volgens Brehm (³) bring 'n huishond teef van 3 tot 10 kleintjies voort, gewoonlik 4 tot 6, maar in buitengewone gevalle mag sy tot 20 of meer kleintjies kry.

Graag wil ek mnr. Chris Pisart vir die foto van ses jong wildehonde bedank.

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Their investigation led them to believe that this parasite might also have been responsible for a great reduction in the numbers of *L. pictus* in the Kruger Park south of the Olifants River.

For purposes of comparison it may be noted that in the domesticated dog, which is also a prolific breeder, there are from four to six pairs of teats with an average of five pairs. In the smaller breeds there are less and sometimes there is an odd number (ref. 5). According to Brehm (3) a dog brings forth from 3 to 10 pups, generally from 4 to 6, but in exceptional cases she may have 20 or more.

I am indebted to Mr. Chris Pisart for the photograph that he has kindly placed at my disposal.

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FORELPIONIER F. C. BRAUN

1875 - 1959

S. S. du Plessis

ELKE land waar die forel in helder bergstrome swem, het forelpioniers opgelewer; privaat persone wat hulleself beywer het vir die vestiging van hierdie gesogte sportvis in die waters van hulle omgewing.

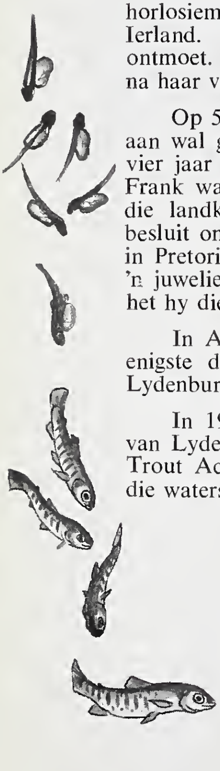
Ons man in Transvaal was Frank Charles Braun, 'n juwelier van Lydenburg. Hy is op die 8ste November 1875 in Spaichingen, Duitsland gebore, as die seun van 'n orrelbouer Johann Michael Braun. In die helder stroompies van sy tuisland het Braun reeds as 'n seun geleer om forelle te kielie en met die kaal hand te vang.

In 1891 op 'n ouderdom van 16 jaar, het Frank as 'n horlosiemaker begin werk en in 1897 verhuis hy na Dublin, Ierland. Hier het hy sy toekomstige eggenote, Bertha Roch ontmoet. Sy was 'n Duitse meisie van Wupperthal wat na haar vader se dood by haar oom in Dublin kom woon het.

Op 5 Mei 1903 het Braun as 'n immigrant in Kaapstad aan wal gestap en in Port Elizabeth gaan werk. Nadat hy vier jaar hier gewoon het, het hy na Graaff-Reinet verhuis. Frank was 'n groot liefhebber van die berge en toe hy op die landkaart sien dat Transvaal baie berge het, het hy besluit om sy tuiste hier te maak. Nadat hy vir 'n tydlank in Pretoria werksaam was, is hy in 1908 na Lydenburg om 'n juwelierswinkel daar te gaan bestuur. Die volgende jaar het hy die besigheid gekoop.

In April 1910 is hy met Bertha Roch getroud. Hulle enigste dogter Olive, besit vandag die juwelierswinkel in Lydenburg.

In 1910 het Kolonel Damant, die destydse magistraat van Lydenburg twee verteenwoordigers van die „Transvaal Trout Acclimatisation Society" te Potchefstroom gevra om die waters van Lydenburg te kom ondersoek. Mnr. Conway



TROUT PIONEER F. C. BRAUN (1875-1959)

S. S. du Plessis

EVERY country where trout swim in cold, clear mountain streams, has produced trout pioneers; private persons who have interested themselves in stocking the streams of their environment with this popular sport fish.

One of the earliest pioneers in the Transvaal was Frank Charles Braun, a jeweller of Lydenburg. Frank Braun was born in Spaichingen in Germany, on the 8th November, 1875. His father Johann Michael Braun, was an organ builder and in the clear streams around his birthplace Frank learnt to tickle and catch trout by hand when still a boy.

In 1891 at the age of 16 he started work as a watchmaker, and in 1897 Braun moved to Dublin, Ireland. Here he met his future wife, Bertha Roch, a German girl who was born in Wupperthal, who after losing her father at the age of seven years, went to live with her uncle in Dublin.

On the 5th of May, 1903, Frank landed in Cape Town from where he left for Port Elizabeth in the same month. Here he worked for four years after which he moved to Graaff-Reinet. Frank was a lover of mountains, and when he noticed from the map that there were many mountains in the Transvaal he decided to make his home there. After he had worked in Pretoria for a while, he went to Lydenburg in 1908 to take charge of a jeweller's shop which he bought in the following year.

In April, 1910 he married Bertha Roch, and their only daughter, Olive, now owns his jeweller's shop in Lydenburg.

In 1910 Colonel Damant, then magistrate of Lydenburg, asked two representatives of the Transvaal Trout Acclimatisation Society from the trout hatchery at Potchefstroom to examine the waters of Lydenburg. Mr. Conway Harvey was one of the representatives. They brought 1,000 trout ova with them, which they planted in the Sterkspruit and Dorpsrivier in the town. This aroused great interest in trout and in 1915 the postmaster, Mr. Gürr, established a hatchery for trout ova in the water furrow in front of his home. Here trout ova were hatched in 1916, 1917 and 1918.

Mr. David Rabie of the farm Kraaibosch in the Lydenburg district still remembers the winter's day in 1916 when he and his father, the late Carl Theodorus Rabie, turned up at Mr. Gürr's home by horse-cart at half past five in the morning. They counted out 200 fry in a Kaffir pot which was fastened to the rear of the cart, and just as they brought the pot of fry to the Pot Spruit at Kraaibosch, it slipped and broke in the water. Though a large trout was washed up on the banks during a flood in 1917, nobody took much notice of the stream until 1922 when Messrs. Braun, Huggard and A. A. Morgan fished the Pot Spruit and caught 72 trout one Sunday.

Harvey was een van hulle. Hulle het 1,000 foreleiers saamgebring en dit in die Sterkspruit en Dorpsrivier naby die dorp geplant. Hierdie gebeurtenis het die belangstelling in forelle gaande gemaak en die posmeester mnr. Gürr het 'n klein forelbroeiery in die watervoor voor sy huis begin. Hier is foreleiers in 1916, 1917 en 1918 uitgebroei.

Braun en 'n vriend met 'n dag se vangs van forelle.

Braun and a friend with a day's catch of trout.

Mnr. David Rabie van die plaas Kraaibosch in Lydenburg distrik, kan nog goed onthou hoe hy en sy oorlede vader Carl Theodorus Rabie een winterdag in 1916 om halfses die oggend met 'n perdekar by mnr. Gürr se huis opgedaag het. Hulle het 200 vissies uitgetel en dit in 'n kafferpot agter op die kar vasgemaak. Net toe hulle die vissies in die rivier op die plaas wou loslaat, het die kafferpot gegly en in die rivier stukkend geval. Van toe af is die spruit bekend as Potspruit. Alhoewel 'n groot forel tydens 'n vloed in 1917 op die wal uitgespoel het, het niemand hom veel aan die Potspruit gesteur nie, tot in 1922 toe mnre. Braun, Huggard en A. A. Morgan op 'n Sondag in daardie jaar, 72 forelle daar gevang het.

Braun was 'n gebore liefhebber van die natuur en 'n groot jagter, maar namate sy belangstelling in forelle gegroei het, het hy sy geweer verruil vir die visstok.

Hy het nou besef dat daar groot moontlikhede vir forelle in Oos-Transvaalse berge was en in 1922 het hy die eerste besending van 1,000 foreleiers uit die Kaapprovinsie ontvang. In daardie jaar het hy 587 klein vissies in Sterkspruit, nege myl bokant die dorp, in die Santa en in die Auxloop losgelaat. Baie jare later het hy vir my vertel hoe verbaas die mense van Lydenburg was om te sien hoe hy saam met 'n paar bantoehelpers met 'n paraffienblik vol klein vissies op sy kop aanstryk langs Sterkspruit op.

F. C. Braun.

Frank Braun was a born lover of nature and a great hunter, but as his interest turned to trout, he exchanged his gun for the fishing rod.

In 1922 he received the first 1,000 trout ova from the Cape Province, and released 587 fry in the Sterkspruit, nine miles above the town, the Santa and in Auxloop. Many years later Frank described to me the surprise of the Lydenburg people at seeing him, together with a few bantu assistants setting off up the Sterkspruit valley with a paraffin tin of trout fry on his head.

So groot was sy vreugde toe hy 18 maande later 'n forel van 3½ pond in die Sterkspruit gevang het, dat hy agt myl na die dorp toe gehardloop het om die vis te laat fotografeer terwyl dit nog vars was. Ek het dikwels saam met hom in die berge geloop toe hy byna 80 jaar oud was en ek kan verstaan dat so iets vir hom geen besondere prestasie moes gewees het nie.

Braun se broeihuis vir foreleiers.
Braun's hatching house for trout eggs.

Om in die veld te stap was vir Braun 'n wonderlike ontspanning. So het hy eendag 12 myl langs die Ohrigstadrivier geloop net om te sien of dit geskik sal wees vir forelle. Volgens sy eie beskeie berekening het hy in sy tyd 18,000 myl agter forelle aangeloop.

Voor 1947 toe die Afdeling Natuurbewaring gestig is, was die beplanting van forelwaters in die hande van private organisasies. Te Lydenburg is die „Lydenburg Trout Protection and Angling Society" in 1924 gestig met Braun as sekretaris. Met fondse wat hy uit subskripsies en donasies verkry het, het hy van 1922 tot 1948 600,000 foreleiers in die Kaapprovinsie gekoop en die klein vissies in Transvaalse bergstrome versprei.

Die sukses wat Braun met hierdie nuwe stokperdjie behaal het, moet aan sy onselfsugtige belangstelling in die vis en die sport toegeskryf word. Spoedig het sy winkel 'n vergaderplek van forelhengelaars geword en is hy algemeen aanvaar as 'n kenner van die forrel. Hy het goed besef welke waarde die forelhengel vir Lydenburg gehad het en hy het gevolglik geen moeite ontsien om besoekers te help nie.

As hy enigsins getwyfel het of 'n besoeker op sy eie sou regkom, het Braun dit as 'n goeie verskoning beskou om sy winkel te sluit en saam te gaan vir 'n namiddag se hengel. Wanneer die winkel nie gesluit kon word nie, het mev. Braun maar agter die toonbank ingespring. Hierdie hulpvaardigheid van Braun het veroorsaak dat hy dikwels snags horlosies moes heelmaak.

By die begin het die destydse Padinspekteur mnr. J. F. Huggard, mnr. Braun baie gehelp met die verspreiding van klein vissies. Hy was 'n Ier van geboorte en self 'n geesdriftige forelhengelaar.

So great was his joy, when 18 months later he caught one fish weighing 3½ lb. in the Sterkspruit, that he ran eight miles to the town to have the fish photographed while it was still fresh. I have often walked with him on the mountains around Lydenburg when he was nearly 80 years old and I readily appreciated that this was nothing unusual to him.

Walking in the veld was a wonderful recreation for him. One day he walked 12 miles on the mountains along the Ohrigstad River just to see what the river looked like. According to his own modest estimate he had walked 18,000 miles after trout in his time.

Prior to 1947, when the Nature Conservation section came into being, the stocking of trout waters was in the hands of private organisations. At Lydenburg, the Lydenburg Trout Protection and Angling Society was established in 1924 with Braun as secretary. With funds which he collected from subscriptions and donations from members he purchased 600,000 trout ova in the Cape from 1922 to 1948 and released the fry in Transvaal mountain streams.

The success which Braun achieved with this new hobby of his, must be attributed to his selfless interest in the fish and the sport. His shop soon became the rendezvous of trout anglers, as he was generally accepted as the expert in this field. Frank Braun realised the value of trout fishing to Lydenburg and he spared no pains to furnish visitors with information. When he was in any doubt as to whether a visitor would manage on his own, he used this as a good excuse to close the jeweller's shop for an afternoon and to go fishing with him. When he could not close the shop, Mrs. Braun came to the rescue and served behind the counter. This friendliness of his often required him to carry out his watch repairs at night.

At first Mr. J. F. Huggard, then Road Inspector at Lydenburg, assisted Mr. Braun to a great extent with the distribution of trout fry. He was Irish by birth and an enthusiastic trout angler.

Up to 1936 Mr. Braun had to put his hatching boxes in the water-furrow, but during that year a small hatching house was erected at the municipal waterworks.

Mr. Braun also endeavoured to make the farmers in his vicinity trout conscious. As practically all trout waters in the Eastern Transvaal are situated on private land, it was also necessary to retain the goodwill of the riparian owners. In this Braun succeeded so well that even today after his death, there are few riparian owners who forbid anglers to catch trout on their land. Braun himself was the owner of 500 morgen on the Auxloop which he purchased mainly for the sake of angling.

Op tot 1936 moes mnr. Braun die foreleiers sommer in die watervoor uitbroei, maar in daardie jaar is 'n klein broeihuis by die Munisipale Waterwerke gebou.

Braun het baie gedoen om die boere rondom Lydenburg forelbewus te maak. Omdat feitlik alle forelstrome in Oos-Transvaal op privaat eiendom geleë is, het hy ook daarna gestrewe om die goeie gesindheid van die oewereienaars te behou. Hierin het hy so goed geslaag dat daar selfs vandag na sy dood nog min oewereienaars is wat ordentlike hengelaars sal verbied om op hulle plase forel te vang. Hy het self 500 morg op die Auxloop besit wat hy hoofsaaklik vir die forelhengel se ontwil gekoop het.

Na die totstandkoming van die Visseryinstituut te Lydenburg in 1949, het die Provinsiale Administrasie die beplanting van forelwaters oorgeneem. Met die totstandkoming van hierdie instituut te Lydenburg, is een van Braun se grootste ideale verwesenlik. Hier was hy dan ook 'n gereelde en geëerde besoeker.

Selfs in die latere jare van sy lewe toe sy oë so verswak was dat hy sy vriende slegs aan hulle stemme kon herken, het hy nog 'n lewendige belangstelling in sy omgewing getoon. Selfs toe hy nie meer kon sien waar sy forelvlieg die water raak nie, het hy nog probeer hengel om die gedwonge ledigheid van sy oudag te verdryf.

Op 22 November 1959 is hy in die ouderdom van 84 jaar te Lydenburg oorlede.

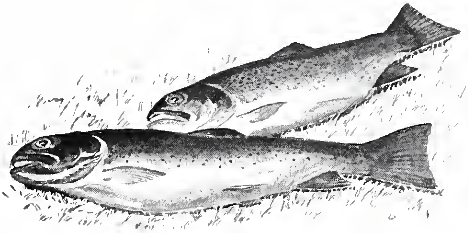
Ter gedagtenis aan sy werk in belang van forelhengel in Transvaal, is die pragtige klein akwarium by die Visseryinstituut na hom vernoem.

After the establishment of the Provincial Fisheries Institute at Lydenburg in 1949 the Provincial Administration took over the stocking of trout waters. With the establishment of this institute at Lydenburg one of Braun's great ideals was realised. Here he was a regular and respected visitor.

Even in the latter years of his life when his eye-sight became so bad that he could only recognise his friends by their voices, he still displayed a keen interest in his environment. Even when he was unable to see where his fly touched the water, he still tried to fish for trout in order to dispel the enforced idleness of his old age.

On 22nd November, 1959, he died at Lydenburg at the age of 84 years.

In memory of his outstanding contribution to trout fishing in the Transvaal, the beautiful little aquarium at the Fisheries Institute, Lydenburg, was named after him.



PLANTE VAN DIE ABEL ERASMUSPAS

M. J. Wells en **R. G. Strey**
Nasionale Herbarium, Pretoria

VIR die besoeker is die geskikste roete na die Abel Erasmuspas deur Middelburg, Belfast, Dullstroom, Lydenburg en Ohrigstad. Die reis gaan dus eers deur die Noord-oostelike Sanderige Hoëveld*, waar die bome wat voorkom meestal aangeplant is: bloekombome in plantasies en keëldraende bome langs die paaie in die klein dorpies. Dullstroom, die koudste plek in Transvaal, het 'n klimaat wat heeltemaal geskik is vir Europese bome waarvan daar groot getalle deur die vroeë nedersetters aangeplant is. Ons vind hier wilgers (*Salix babylonica*), eikebome (*Quercus* spp.), lindebome (*Tilia* spp.), kastaiings (*Castanea* spp.), Europese beuke en koper-beuke (albei variëteite van *Fagus sylvatica*) wat groei in 'n leegte tussen klipperige heuwels, en waar feitlik die enigste inheemse houtagtige plant, die geharde Transvaalse suikerbos (*Protea caffra*) is.

Vanaf Dullstroom gaan mens af na die Bankenveld* van Lydenburg waar die provinsiale visseryinstituut en akwarium geleë is, kruis die pad wat deur Sir Percy Fitzpatrick en Jock van die bosveld gevolg is en reis dan deur die Suur Gemengde Bosveld* waardeur die pad na Ohrigstad gaan. Onderkant Ohrigstad styg die pad oor digbegroeide dolomietkoppies, waar talryke grotte gevind word, na die kwarts, konglomeraat en lawagesteentes van die hange van die Drakensberg. Die sondeurdrenkte dolomietkoppies kry gemiddeld 20-30 duim reën per jaar en dit is dus nie verbasend dat die wortels van die struikagtige bosveldbome wat daarop groei diep in rotsskeure na water soek nie. Sommige van hierdie wortels is in grotte gevind meer as 'n honderd voet onderkant die grondoppervlakte, waar hulle groen lote en blare gee indien hulle aan kunsmatige lig blootgestel word.

Die platorand ontvang 'n jaarlikse gemiddelde reënval van tot 60 duim, maar die uitdroeënde effek van die winde wat oor die plato waai is sodanig dat die plante van die Noord-oostelike Bergsuurveld minder welig groei, behalwe in die diep klowe en langs waterstrome waar geilgroeiende, 60 voet hoë bome voorkom (sien Fig. 1).

Die Abel Erasmuspas word bereik oor 'n heuwel oortrek met die opvallende bergsering (*Kirkia wilmsii*), boswilgers (*Combretum* spp.) met hulle rooi-bruin blare, en ander kenmerkende bosveldbome wat selde hoër as 20 voet groei. Om 'n draai gaan mens die pas binne wat vernoem is na Abel Erasmus, Veldkornet van Ohrigstad gedurende 1876 en Naturelle-

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* Die verspreidings en samestellings van die veld-tipes hier genoem word uitvoerig beskrywe deur mnr. Acocks in sy „ Veld Types of South Africa " wat by die Staatsdrukker in Pretoria verkrygbaar is.

PLANTS OF THE ABEL ERASMUS PASS

M. J. Wells and **R. G. Strey**
National Herbarium, Pretoria

A VISITOR'S best approach to the Abel Erasmus Pass is through Middelburg, Belfast, Dullstroom, Lydenburg and Ohrigstad. The first part of the route lies on the North Eastern Sandy Highveld* where the commonest trees are exotics: *Eucalyptus* spp. in plantations, and conifers lining the small-town roads. In Dullstroom—the coldest corner of the Transvaal, many European trees, planted by the early settlers, now flourish. Here willows (*Salix babylonica*), oaks (*Quercus* spp.), lindens (*Tilia* spp.), chestnuts (*Castanea* spp.). European beech and copper beech (Both varieties of *Fagus sylvatica*) grow in a hollow between stony hills, where almost the only indigenous woody plant is the hardy Transvaal sugar bush (*Protea caffra*).

From Dullstroom one descends to the Bakenveld* of Lydenburg where the Provincial Fisheries Institute and aquarium are located; crossing the path travelled by Sir Percy Fitzpatrick and Jock of the Bushveld, before setting out through the Sourish Mixed Bushveld* which flanks the road to Ohrigstad. Beyond Ohrigstad the road rises over scrub-covered dolomite koppies honeycombed with caves, towards the quartz, shale, conglomerate and lava rock of the Drakensberg escarpment. The sun-baked, windswept dolomite koppies receive a mean annual rainfall of only 20 to 30 in., thus it is little wonder that the roots of the scrubby bushveld trees which grow on them seek water deep in rock crevices. Some of these roots have been found in caves over a hundred feet beneath the land surface, and here they produce green shoots and leaves if exposed to artificial light.

The escarpment edge receives a mean annual rainfall of up to 60 in., but such are the dessicating effects of plateau top winds that the North Eastern Mountain Sourveld* vegetation remains stunted, except in deep kloofs and alongside streams where luxuriant sixty-foot high trees occur (See Fig. 1).

The pass is approached over a long hill covered with the distinctive mountain seringa (*Kirkia wilmsii*), russet-leaved

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* The distributions and constitutions of veld types mentioned here are detailed by Mr. Acocks in his "Veld Types of South Africa" obtainable from the Government Printer, Pretoria.

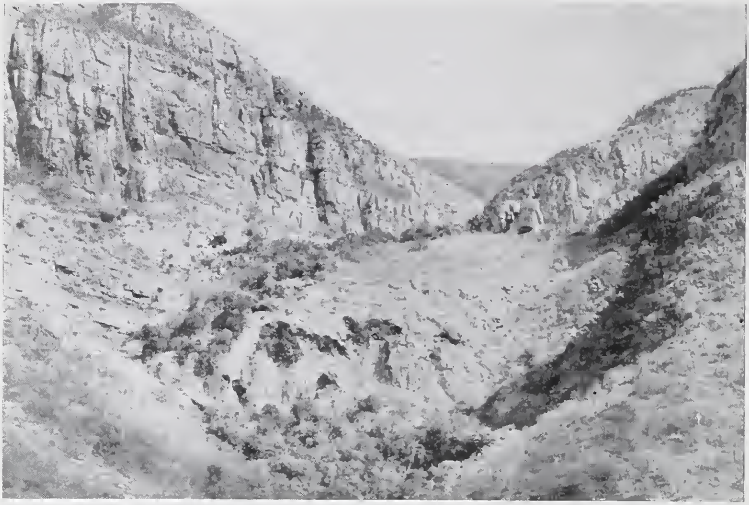

FIG. 1. (Foto/Photo: M. J. Wells.)

Die bergpoort van die Abel Erasmuspas waardeur die pad teen die voet van die kranse loop. Sestig voet hoë bome op die stroomwal vorm 'n kontras met die kreupelhout van die berghange. Die stroom vloei oor 'n kalsietheuwel waarin fossiel blaarafdrukke gevind is—sien Fig. 6.

The mountain gap through which the road passes. Sixty foot streambank trees contrast with the stunted scrub on the mountain slopes. The stream flows over a hillside of calcite containing fossil leaf impressions—see Fig. 6.

kommissaris vir Lydenburg gedurende 1881, wat hierdie pad gebou het om die invordering van naturellebelasting te vergemaklik. Abel Erasmus sou vandag skaars hierdie breë moderne pad met sy tonnel, vernoem na wyle Min. J. G. Strijdom, herken as die ruwe bergpad van vervloë dae. Die nuwe pad wat toegang verleen tot die vrugteplase van die noorde, kronkel deur 'n diep kloof met toringagtige kranse en het drie jaar geneem om te voltooi teen 'n koste van R1,130,000.

Die pas daal 2,400 voet na die Olifants Rivier wat van bo deur die hittenewels gesien kan word waar dit sy weg baan deur die veel droër laeveld. Hierdie deel van die laeveld is die mees suidelike groeiplek van die reusagtige baobab of kremetartboom (*Adansonia digitata*). Hoewel die kremetart in die Republiek in lae reënvalstreke voorkom, word dit in ekwatoriale gebiede, waar die verdampingstempo baie hoog is, saam met die klapperpalm (*Cocos nucifera*) en cerwoudbome in plekke soos Zanzibar met 'n gemiddelde jaarlikse reënval van meer as 60 duim, aangetref.

Die Abel Erasmuspas het ook die gebied oopgestel vir botaniese ondersoek en gedurende die afgelope paar jaar is agt of meer nuwe soorte en variëteite ontdek, insluitende 'n nuwe boswilg (*Combretum* sp.), 'n orgideë (*Bonatea* sp.) en 'n lelie (*Drimiopsis* sp.). Nuwe rekords vanaf hierdie gebied is onder andere die algemeen gekweekte pers *Holmskioldia* (*H. tettensis*) en *Pachypodium saundersii*, in Rhodesië bekend as die „ster van Lundi ". Hierdie stekerige rotsplant, verwant aan die Impala

bush willows (*Combretum* spp.) and other characteristics, gnarled bushveld trees which seldom exceed 20 ft. in height. Rounding a bend one enters the pass which was named after Abel Erasmus, Field Cornet for Ohrigstad in 1876 and Native Commissioner for Lydenburg in 1881, who pioneered this rugged trail to the lowveld in order to collect natives' taxes. Today he would have difficulty in recognising this important gateway to the fruit farms of the north, which took three years to construct at a cost of R1,130,000, and which includes the J. G. Strijdom tunnel and numerous fine sweeps of embanked road beneath towering krantzes. The pass drops 2,400 ft. to the Olifants River, which can be seen through the heathaze, winding its way across the arid Lowveld—the southern-most limit of the giant baobab or cream of tartar tree (*Adansonia digitata*). It is of interest to note that in equatorial regions—like Zanzibar, where the mean annual rainfall exceeds 60 in. and the evaporation rate is exceedingly high, baobabs grow side by side with coconut palms (*Cocos nucifera*) and forest trees.

The Abel Erasmus Pass has opened the way to botanical exploration and during the past few years the area has yielded eight or more species and varieties new to science, including a new bush-willow (*Combretum*), an orchid (*Bonatea* sp.) and a lily (*Drimiopsis* sp.). New records from the area include the widely cultivated purple *Holmskioldia*

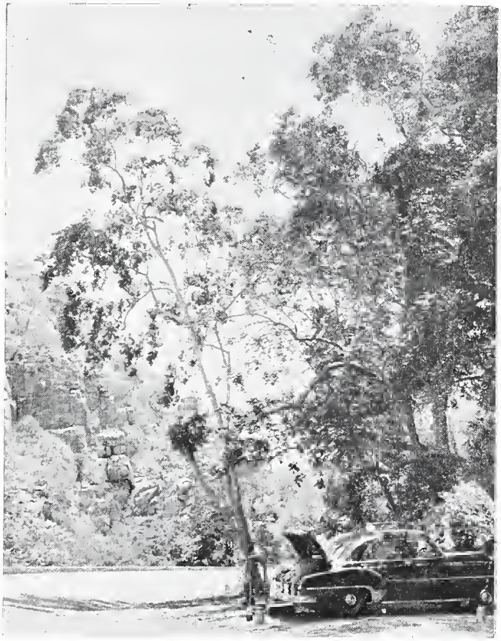

FIG. 2. (Foto/Photo: M. J. Wells.)

Labelled trees: *Celtis africana* and *Trichilia roka* growing at a picnic spot beside the road.

Gemerkte bome: *Celtis africana* en *Trichilia roka* wat by 'n piekniekplek langs die pad groei.

lelie (*Adenium multiflorum*) met 'n geswolle silwer-grys stingel met 'n basis op tot ses voet in deursnee, word tot sover suid as die Lebombo berge in Zululand aangetref.

In die poort self waar die pad 'n klipperige stroom oorbrug, is die mees opvallende bome van naamplate voorsien—'n teken van die steeds groeiende belangstelling van die publiek (sien Fig. 2). Hier word die welbekende moepel (*Mimusops zeyheri*), *Rauvolfia caffra* met die misleidende naam „kinaboom"—sowel as minderbekende maar nogtans aantreklike bome soos *Homalium dentatum, Vitex wilmsii, Chaetachme aristata* en *Euclea divinorum* gevind. Die latynse woord „divinorum" is afgelei van die gebruik van die plant deur Oos-Afrikaanse toordokters in uitruik („divining")—seremonies. Een van die plante wat van etikette voorsien is, is die bergsering (*Kirkia wilmsii*), een van die min bome wat net in die Transvaal voorkom, en wat in Mei die rante helderrooi kleur met sy pragtige herfsblare. Hierdie boom groei altyd op dolomietformasies.

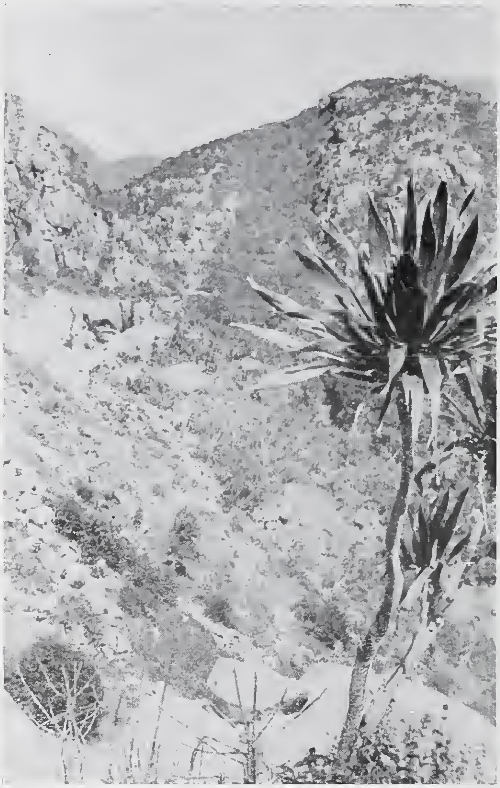

FIG. 3. (Foto/Photo: J. Schlieben.)

'n Hoë *Dracaena* wat uit sy plek voorkom op die blootgestelde kranse.

A tall *Dracaena* looking rather out of place on the exposed krantzes.

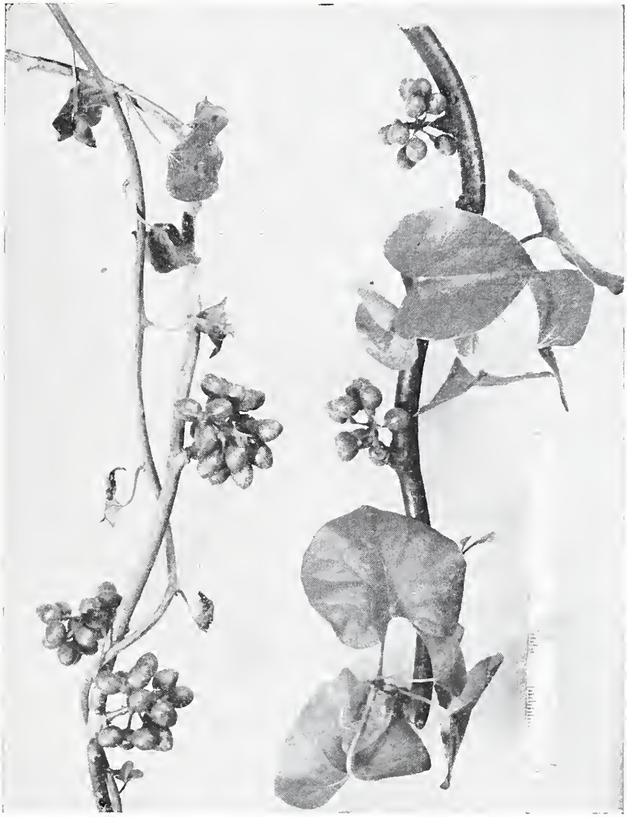

FIG. 4. (Foto/Photo: J. Reyburn.)
The "wonder plant" *Tinospora frugosum.*
Die „wonderplant" *Tinospora frugosum.*

(*H. tettensis*) and *Pachypodium saundersii* known in Rhodesia as the "star of Lundi". This spiny rock plant which is related to the impala lily (*Adenium multiflorum*) has a silver-grey swollen stem up to six feet in diameter, and is found as far south as the Lebombo Mountains of Zululand.

In the poort itself, where the road bridges a rocky stream, the most prominent trees have been labelled—a tribute to the growing public interest in the South African vegetation (Fig. 2). Here can be found the well-known moepel (*Mimusops zeyheri*), the misleadingly named "quinine tree" (*Rauvolfia caffra*)—as well as lesser known but equally attractive trees such as *Homalium dentatum, Vitex wilmsii, Chaetachme aristata* and *Euclea divinorum* whose latin name is derived from the use of the plant by East African native diviners in "smelling out" ceremonies. Also labelled are the mountain seringa (*Kirkia wilmsii*)—one of the few trees which occur only in the Transvaal, and whose beautiful autumn leaves

Die Transvaalse essenhout (*Ekebergia meyeri*) 'n goeie skadu-boom, en die Kaapse wildevy (*Ficus capensis*) wat groot trosse „ vrugte " aan die onderste takke en soms selfs op die blootgestelde wortels dra, kom ook hier voor. Hierdie „ vrugte " soos alle ander vye, is in werklikheid geswolle blombodems waarbinne talryke klein blommetjies ontwikkel en dikwels bestuif word deur klein vlerklose wespe. Daar is 'n opening aan die bopunt van elke blombodem waardeur die wespe indring na die binneste holte. Die opening gaan later toe en die wespe, baie waarvan slegs in die vye van een soort gevind word, lewe in algehele duisternis. Wanneer die menigte klein vruggies binne die vy volwasse is, val die vy op die grond waar dit verrot om sodoende die volgende generasie wespe vry te laat. Die verrotte vye het 'n groot aantrekkingskrag vir die helder gekleurde *Charaxes* skoenlappers, wat dikwels gefermenteerde sappe hieruit suig totdat hulle heeltemal dronk is en op die grond rondfladder en val—'n maklike prooi vir voëls en versamelaars. Elke stadium in 'n siklus kan dus 'n stadium in baie ander lewenssiklusse wees—die wedersydse verhouding in 'n plant- en dieregemeenskap is soms ingewikkeld en interessant. Enige oplettende persoon wat tussen die bosse in die poort rondloop, kan beloon word deur sulke interessanthede soos bv. die waarneming van die heldergroen swaardstert skoenlapper (*Papilio antheus*) besig om sy eiers op die wilde vla-appel (*Annona senegalensis*) te lê.

Die Kaapse wildevy het dikwels in die lente heldergekleurde jong blare, maar hierdie verskynsel is selfs nog meer opvallend by die rooiwildevy (*Ficus ingens*) wat algemeen op die kranse voorkom.

Een van die opvallendste bome is die rooi-essenhout of „ donderboom " van die Zoeloes (*Trichilia roka*). Uit die bas en wortels van hierdie boom kan 'n sterk en soms gevaarlike braakmiddel gemaak word. Die olie en vet wat uit die saad berei word, staan bekend as Mafura olie en Mafura vet en die gedeelte wat oorbly nadat die olie en vet verwyder is, is blykbaar giftig vir vee indien die buitenste dop nie afgeskil word voordat die vrugte stukkend gedruk word nie.

'n Ander gemerkte boom wat olie oplewer, is die „ oliepitboom " (*Pappea capensis*), die pitte waarvan meer as 70 persent olie—wat vergelyk kan word met katoensaadolie—bevat. Dit is egter moeilik om genoeg vir ekonomiese doeleindes te versamel. Die matumi of mingerhout (*Adina microcephala* var. *galpinii*) soms bekend as „ redwood " of wilde *oleander*, waaraan dit geensins verwant is nie, is 'n belangrike saaghout in Njassaland. In gedeeltes van Afrika word dit algemeen gebruik in die maak van kanos. Die hout het 'n fyn grein, is olierig, duursaam en bied weerstand teen termiete en is al gebruik vir die maak van blokkiesvloere en waens. 'n Ekstrak van die bas word deur naturelle gebruik om maagongesteldheid te behandel. Ander gemerkte bome is die mtserie (*Bridelia micrantha*), die witstinkhout of kamdebo-stinkhout (*Celtis africana*), die blou gwarrie (*Euclea crispa*) en die wilde amandel (*Phyllogeiton discolor*) wat in Noord-Rhodesië tot een van die Barotse voedselbome verklaar is as gevolg van die vlesige vrugte wat dit dra.

Die vrugte van die olienhout (*Olea africana*) word deur naturelle gebruik in plaas van koffie en is nouverwant aan die gekweekte olyf (*Olea europaea*) wat sedert Noag se tyd as 'n simbool van vrede, van skadu, en soms van lig gedien het.* Volgens Verdoorn** is die enigste

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* Moldenge: Plants of the Bible, Chronica Botanica Company, 1952.

** Verdoorn: The Oleaceae of South Africa, Bothalia vi, 3.

colour the dolomite hills a bright red in May, the mountain ash or essenwood (*Ekebergia meyeri*) which is a fine shade tree, and the Cape wild fig (*Ficus capensis*) which produces large clusters of " fruit " on its lower branches and sometimes even on exposed roots. These " fruits " like all figs are really swollen receptacles inside which many small flowers are produced—often to be pollinated by tiny, wingless wasps. There is a hole in the apex of each receptacle, through which the wasps penetrate to the cavity within. Later the hole closes and the wasps, many of which only inhabit figs of a certain species, live in total darkness. When the many fruits are mature the fig drops to the ground and rots, eventually releasing the next generation of wasps. The rotting figs prove a great attraction to brilliantly coloured *Charaxes* butterflies which suck the fermenting juices, till they are drunk and flop about on the ground—an easy prey to birds or collectors. Thus each stage in a cycle may also be a stage in many other cycles; the inter-relationship in a plant and animal community are often complex and fascinating.

Anyone who fossicks about in the woodland lining the poort may be rewarded by interesting observations such as the flashing green swordtail butterfly (*Papilio antheus*) laying its eggs on the wild custard apple (*Annona senegalensis*).

The Cape fig produces vividly-coloured young leaves in spring, but cannot equal the brilliant colour of the " red leaf fig " (*Ficus ingens*) which is common on the krantzes. Another prominent labelled tree is the Natal mahogany or " thunder tree " of the Zulus (*Trichilia roka*) whose bark and roots yield a powerful, sometimes dangerous, emetic. The seed oil and fat of this species are known as Mafura oil and tallow, and the cake that is left is probably poisonous to stock if the outer shells are not peeled off before the seeds are crushed. Another labelled oil producer is the " oil seed tree " (*Pappea capensis*) whose kernels yield over 70 per cent oil, comparable in value to that of cotton seed oil—but difficult to collect in economic quantities.

Also of interest is the matumi or mingerhout (*Adina microcephala var. galpinii*) sometimes known as " redwood " or " wild oleander " to which, however, it is not at all related. Mingerhout is an important sawtimber in Nyasaland and is most favoured for use in making dug-out canoes in parts of Africa. The wood is fine-grained, oily, durable and termite-resistant and has been used in making parquet floors and wagons. An extract of the bark is used by natives to treat stomach disorders.

Also labelled are the mitserie (*Bridelia micrantha*), the white or kamdebo stinkwood (*Celtis africana*) the blue gwarrie (*Euclea crispa*) and the bird plum (*Phyllogeiton discolor*) which in Northern Rhodesia has been declared one of the Barotse food trees by virtue of the succulent fruit it bears.

The wild olive (*Olea africana*) extracts of whose leaves the natives use as a substitute for coffee, is closely related to the cultivated olive (*Olea europaea*) which since the time of Noah has been a symbol of peace, of shade, and sometimes even of light*. *Verdoorn*** writes " The only tangible difference between the two species are the larger flowers and the larger, more fleshy fruits of the cultivated olive which may have come about through selection and cultivation but, if so, these characters have now been established and reproduce true to type ".

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* Moldenke: Plants of the Bible, Chronica Botanica Company, 1952.

** Verdoorn: The Oleaceae of Southern Africa, Bothalia VI, 3.

werklike verskil tussen die twee soorte die groter blomme en die groter vlesige vrugte van die gekweekte olyf, wat heelwaarskynlik toegeskryf kan word aan seleksie en kweking. Indien dit die geval is, dan het die kenmerke nou gevestig geraak en teel hulle suiwer voort.

Nog 'n opvallende boom is die jakkalsbessie (*Diospyros mespiliformis*) ook bekend as „ African ebony ". Dit is bekend dat jakkalse dikwels die vrugte van hierdie boom vreet, sowel as vrugte van baie ander soorte—soos blyk uit die volgende aanhaling uit die Hooglied van Salomo: „ Vang julle vir ons die jakkalse, die klein jakkalse wat die wingerde verniel, want ons wingerde staan in die bloei."

Ander plante van belang langs die pad is die wildetabak (*Nicotiana glauca*) met appelkoos-kleurige, buisvormige blomme—'n soort wat lank gelede vanaf Suid-Amerika ingevoer is, en die 10 voet hoë palmagtige *Dracaena*, 'n lid van die leliefamilie (*Liliacea*) (sien Fig. 3).

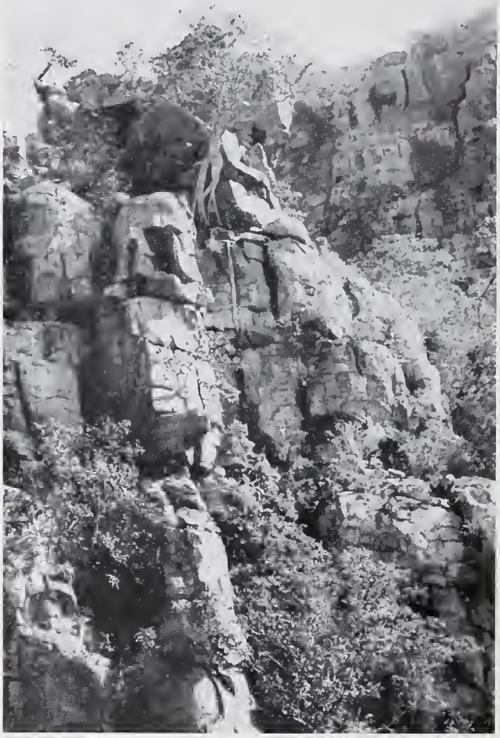

Fig. 5. (Foto/Photo: J. Schlieben.)

'n Wildevy op die rand van 'n krans, met sy wortels diep in rotsskeure.

A wild fig perched at the top of a krantz, its roots deep in rock crevices.

Last of the labelled trees is the African enbony (*Diospyros mespiliformis*) also known as the "jakkalsbessie". Jackals may especially favour fruit of this tree, but they also eat the fruits of many other species, as evidenced by these lines from the Song of Solomon: "Take us the foxes, the little foxes, that spoil our vines: for our vines have tender grapes."

Other plants of interest beside the road are the wild tobacco plant (*Nicotiana glauca*) with its apricot-coloured, tubular flowers—a species long ago introduced from South America, and the 10 ft. tall, palm-like *Dracaena*, a member of the family *Liliaceae* (see Fig. 3).

In the roadside stream where South Africa's famed jumping frogs (*Rana* spp.) abound one may find maiden hair fern (*Adiantum capillus veneris*), the common yellow water buttercup (*Ranunculus pubescens*), the six-angled sedge (*Cyperus sexangularis*) and the 'wild' banana (*Musa* sp.) escaped from cultivation.

The lush streambank vegetation is in sharp contrast with the dry scrub of the surrounding stony mountain slopes where blue-tailed lizards bask between roots of sickly green-stemmed paper bark trees (*Commiphora* spp.) It is here that the so-called "wonder plant" (*Tinospora frugosum*) grows commonly (see Fig. 4). The popular name of this semi-succulent creeper derives from its ability to send down long roots from pieces of stem bitten off and left by browsing animals. Many people place broken bits of stem on their verandah walls, whence the roots may be watched and measured as they trail infallibly towards a pot of damp sand placed many feet beneath. However, some farmers exploited both the plant and the public by selling pieces of stem for as much as two Rand each. As a result the "wonder plant" has now been gazetted a protected plant of the Transvaal.

The twisted bush willows (*Combretum* spp.) and silvery leaved *Croton* (*C. gratissimus*) form a dense tangle below oxide streaked, gunmetal coloured krantzes encrusted with lichen. This lichen is a complex of fungi and algae living together, and after rain the green algae in the lichen make the krantzes appear greener than the bush-covered slopes below.

In places the smooth white roots of wild figs (*Ficus* spp.) stretch for hundreds of feet between the rocks, making a crazy paving of the krantz. Sometimes these roots bind the rocks together and form a platform for invasion by less well-adapted plants, but in other places fig roots force the rocks apart, thereby causing rockfalls (see Fig 5).

A familiar sentinel of the krantzes is the common candelabra *Euphorbia* (*E. ingens*). Local natives do not ascribe supernatural powers to this plant but Xosa people of the Transkei plant these *Euphorbias* outside their huts when twins are born, in the belief that the trees will influence the children they represent—and keep away witchcraft. It is perhaps not by accident that this tree was chosen since it can be relied on to thrive in most situations that are frosfree and not shaded.

Such stories are of passing interest, for the most fascinating phenomenon of the Abel Erasmus area is to be found in the great freshwater tuff blocks (calcium carbonate deposits) which are to be found in crotches of the hills wherever a stream breaks through the mountain rampart (see Fig. 1). Millions of years ago the South African plateau was forced up, raising the beds of the streams which flowed over it. These streams leached lime from the local dolomite. At first the climate was moist and

In 'n stroompie langs die pad waar Suid-Afrika se veelgeroemde springpaddas (*Rana* spp.) aangetref word, vind ons ook die vrouehaarvaring (*Adiantum capillus-veneris*), die gewone geelbotterblom (*Ranunculus pubescens*), matjiesgras of biesiegoed (*Cyperus sexangularis*) en 'n piesangsoort (*Musa* sp.) waarskynlik oorspronklik 'n tuinplant.

Die lowerryke plantegroei aan die walle van die stroom vorm 'n skerp kontras met die droë ruigtes van die omringende, klipperige berghange waar bloustertkoggelmanders tussen die wortels van die papierbasbome (*Commiphora* spp.) met hulle bleekgroen stingels, in die son bak. Dit is hier waar die sogenaamde „wonderplant" (*Tinospora frugosum*) algemeen voorkom (sien Fig. 4). Die gewone naam van hierdie halfsukkelende rankplant is afgelei van sy vermoë om uit stukkies van die stingels, wat deur diere afgevreet en agtergelaat word, lang wortels te vorm. Baie mense plaas stukkies van die stingels op hulle stoepe sodat die wortels gesien en gemeet kan word terwyl hulle afgroei na 'n houer met klam sand wat op 'n afstand daarvan neergesit word. Sommige boere het sowel die publiek as die plante uitgebuit deur stukkies van die stingels teen soveel as twee Rand elk te verkoop. Die gevolg is dat die „wonderplant" nou in Transvaal tot 'n beskermde plant verklaar is.

Die boswilgers (*Combretum* spp.) en *Croton gratissimus* met sy silweragtig gekleurde blare vorm 'n digte struikgewas aan die voet van die rooigestreepte, grysgekleurde kranse oortrek met korsmosse. Hierdie korsmos is 'n kompleks van swamme en alge wat saam groei. As gevolg van die groen alge in die korsmos lyk dit na 'n reënbui of die kranse groener is as die beboste hange.

Op plekke gee die gladde wit wortels van die rotswildevye (*Ficus* spp.), wat geweldig lank word, aan die kranse die voorkoms van 'n netwerk. Hierdie wortels bind soms die rotse saam, om sodoende 'n geskikte groeiplek vir ander plante te vorm (sien Fig. 5). Op ander plekke druk die wildevy se wortels egter die rotse vanmekaar en veroorsaak uiteindelik ineenstorting van gedeeltes van die krans en ook die vernietiging van plantegemeenskappe.

'n Bekende baken op die kranse is die gewone naboom (*Euphorbia ingens*), maar in hierdie gebied heg die naturelle geen bonatuurlike magte aan die plant nie. Die Xosas in die Transkei plant twee nabome buite hulle hutte wanneer 'n tweeling gebore word, in die geloof dat die bome 'n mistieke invloed op die kinders, wat hulle verteenwoordig, uitoefen. Dit is waarskynlik nie per toeval dat hierdie boom gekies is nie, aangesien dit floreer in die meeste groeiplekke wat rypvry is en waar daar geen skadu is nie.

Hierdie verhale is van verbygaande aard maar die interessantste verskynsel van die Abel Erasmuspas kan gevind word in die groot varswater tufsteen-blokke (Kalsium-karbonaat neerslae) wat voorkom in engtes in die berge waar waterstrome die bergwal deurbreek. Miljoene jare gelede is die Suid-Afrikaanse plato opgestoot, met die gevolglike verhoging van die stroombeddings wat daaroor gevloei het. Hierdie strome het kalk uit die plaaslike dolomiet uitgeloog. Aan die begin was die klimaat klam en die strome het sterk afgeloop om sodoende hulle beddings te verdiep en het dus min van hulle kalsium gedeponeer. Mettertyd het die klimaat droër geword en is meer en meer kalsiumsoute in korse op die opdrifsels van blare en takkies neergelê.

the streams cut down rapidly, re-grading their beds and depositing comparatively little of their calcium load. But as the climate grew drier, more and more calcium salt was deposited in crusts on the streambed debris of leaves and twigs.

This deposition is readily explained by the solubility of calcium carbonate ($CaCO_3$) in ground water containing dissolved carbon dioxide (weak carbonic acid), and the ease with which calcium carbonate is precipitated when the carbon dioxide escapes. The main agents in eliminating carbon dioxide (CO_2) from streams are water plants—green and blue-green algae which use carbon (C) in building proteins and starch and release oxygen (O_2), often in the form of bubbles.

Since fresh water stream algae are most plentiful at waterfalls, it is not surprising that most calcium carbonate deposition occurs where small waterfalls drop over the edge of the escarpment. Eventually these waterfalls, instead of eating back with the erosive force of water, build out by calcium carbonate deposition.

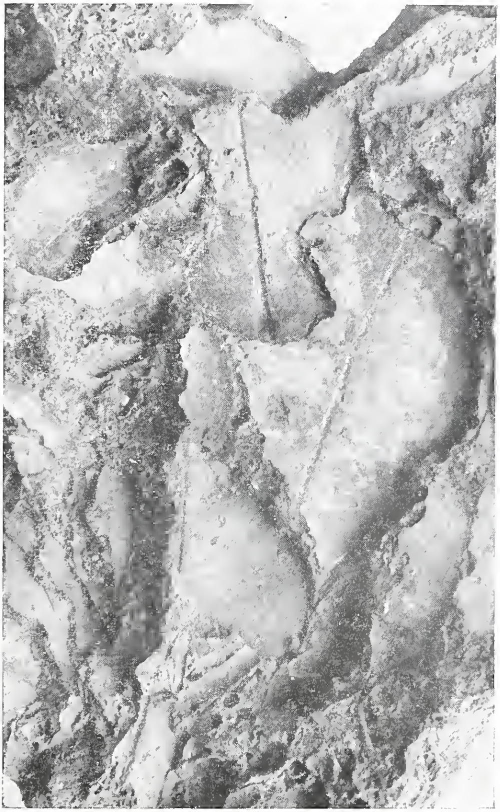

FIG. 6.

Leaf impressions on a calcium salt crust.

Blaar afdrukke op 'n kalsium-sout kors.

Die vorming van hierdie neerslag kan verklaar word deur die oplosbaarheid van kalsium-karbonaat ($CaCo_3$) in grondwater, wat opgeloste koolsuurgas (swak koolsuur) bevat, en die gemak waarmee kalsiumkarbonaat neerslaan wanneer koolsuurgas ontsnap. Die hoofagente vir die opneem van koolsuurgas (CO_2) uit waterstrome is groen en blougroen alge wat koolstof (C) gebruik in die opbou van proteïne en stysel en terselfdertyd suurstof (O_2) vrystel in die vorm van lugblasies.

Aangesien die meeste varswateralge by watervalle voorkom, is dit nie verbasend nie dat die grootste kalsium-karbonaat neerslae gevind word by swakvloeiende watervalle op die platorand wat die droë laeveld begrens. Hierdie watervalle bou derhalwe as gevolg van die neerslag van kalsium-karbonaat na buite op in plaas daarvan om dieper terug te sny as gevolg van die verwerende invloed van water.

Die waterval in Fig. 1 is op so 'n wyse uitgebou en die hele heuwel waaroor dit vloei bestaan uit kalsiumsoute wat op opdrifsels neergelê is. Mettertyd sal die opdrifsels vergaan, en dan sal daar net 'n dop van kalsiumsout kristalle (kalsiet) oorbly, waarop daar dikwels volledige afdrukke van blare of stingels verskyn* (sien Fig. 6).

Aangesien hierdie proses alreeds vir 'n paar miljoen jaar aan die gang is, kan 'n ondersoek van hierdie afsetting heelwaarskynlik 'n waardevolle aanduiding gee van die plantegroei op stroomwalle en moontlik van klimaatsveranderinge gedurende onlangse geologiese tye. Lesers word gewaarsku dat dit onwettig is om met hierdie „fossiele" te peuter.

Soortgelyke tufsteen-blokke met afdrukke van plante kom voor in die Naukloof van Suidwes-Afrika waar hulle ondersoek is deur Henno Martin†. In Suidwes-Afrika is die afdrukke hoofsaaklik dié van plante wat vandag nog diep in bergklowe, waar standhoudende water aangetref word, groei. Dr. Boss het egter ook 'n pluviale flora van soorte wat teenswoordig baie myle daarvandaan in die Transvaal voorkom, gevind. Die omvang en verspreiding van plantegroeitipes kan dus moontlik verkry word deur 'n studie van hierdie fossiele afdrukke in Erasmuspas.

Die aanwesigheid van hierdie waardevolle fossiele rekord dra by tot die interessantheid van hierdie streek met sy ryk plantegroei en opvallende natuurskoon.

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* Op dieselfde manier at wat volledige afdrukke van diere behoue gebly het onder die vulkaniese as (tufsteen) van Pompeï.

† Skrywer van "Vlug in die Namib".

The waterfall in Fig. 1 has built out in just such a way and the whole hill over which it flows is made up of calcium salts deposited on debris. In time the debris decomposes, leaving only a shell of calcium salt crystals (calcite), which often carry perfect impressions of leaves and stems* (see Fig. 6).

As this process has been proceeding for several million years it provides a very valuable but as yet uninvestigated record of streambank vegetation and perhaps of changing climate during recent geological times. Readers are warned that it is illegal to tamper with these " fossils ".

Similar tuff blocks enclosing plant impressions occur in the Naukloof of South West Africa where they have been investigated by Henno Martin†. In South West Africa the impressions are mainly those of plants which still occur deep in ravines where perennial water persists. However, Dr. Boss, a collector in South West Africa, found a pluvial flora of species which now occur many miles away in the Transvaal. Thus evidence of the previous extent of floras may be obtained from a study of the fossil impressions at Erasmus Pass.

The presence of a valuable fossil record adds but another dimension to an already rich botanical region—which equals the Zoutpansberg in scenery and interest.

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* In much the same way that perfect impressions of animals have been preserved beneath the volcanic ash (tuff) of Pompei.

† Author of " The Sheltering Desert ".

DIE KAAPSE VRUGTEVLERMUIS

Rousettus leachii (A. Smith)

Dr. G. L. Lombard

'N KLEIN kolonie Kaapse Vrugtevlermuise is tydens die Uniefeesskou in 1960 in die Transvaalse pawiljoen uitgestal. Daarna het ek die geleentheid gehad om die gedrag van hierdie relatief onbekende diere oor 'n tydperk van een jaar, taamlik deeglik in gevangenskap te bestudeer. Sedert die kort beskrywing van P. L. Sclater in 1870 (3) in verband met die gedrag van hierdie interessante diere, het Cowles (1) 'n deel van hulle gedragspotroon in sy boek ,, Zulu Journal " beskryf. Hier noteer hy die waarnemings van mej. A. J. Alexander op 'n mak vlermuis.

Die 56 vlermuissoorte wat Roberts (2) in Suid-Afrika erken, word opgedeel in ses families. Die betreklik groot vrugtevlermuise wat in die suborde Megachiroptera val, word onder een familie die Pteropidae, wat uit drie genera en vier spesies bestaan, geklassifiseer. Hoewel Roberts meen dat die Kaapse vrugtevlermuis slegs voorkom in die oostelike kusstreek vanaf Kaapstad, noordwaarts tot by Tanga op die kus van Tanganjika, en dit nooit verder as King Williams Town in die binneland gerapporteer was nie, was die vlermuise waaroor hierdie artikel gaan, ver in die binneland in die Matlapitsi vallei in die Pietersburg distrik in Noord-Transvaal versamel.

Vrugtevlermuise word maklik van die inseketende soorte onderskei, nie alleen deurdat hulle groter is nie, maar ook deurdat hulle twee kloue of naels in plaas van een aan elke voorpoot of vlerk besit. Hulle oë is ook groter as dié van die Microchiroptera en hulle ore en neuse besit nie die ingewikkelde membraan-patrone van dié van hulle inseketende verwante nie. Die lang hondagtige kop van dié dier het hom die gepaste naam van vlieënde vos besorg.

Rousettus leachii is die tweede-grootste vlermuis wat in Suid-Afrika voorkom; die vlerkspan van volwasse diere van albei geslagte is tussen 24 en 25 duim (60-63 cms) en die totale liggaamslengte is omtrent 5½ duim (14 cms).

Hoewel dié diere hoofsaaklik wilde vye (*Ficus* spp.) eet, word ander vrugte ook in hulle dieet ingesluit. Vrugteboere ly soms skade deur rooftogte van swerms van dié diere.

Die wisselende bevolkings van hierdie species in sommige distrikte dui op 'n alimentale migrasie (seisoens-soektogte na voedsel). In die Matlapitsi vallei, egter, kom daar verskillende soorte wildevye voor, sodat die diere dwarsdeur die jaar 'n voorraad van hulle hoofvoedsel kan kry en geen groot migrasies hier plaasvind nie.

Die groot grot waarin die Kaapse vrugtevlermuise versamel is, was bewoon deur etlike duisende van hierdie spesies sowel as 'n paar veel kleiner gemeenskappe van verskillende inseketende soorte. Soos ook in

THE CAPE FRUIT BAT
Rousettus leachii (A. Smith)

Dr. G. L. Lombard

WHILE exhibiting a small colony of Cape Fruit Bats in the Transvaal pavilion at the Union Festival in 1960, and subsequently for a period of one year the author had the opportunity of studying the behaviour of these little-known mammals in fair detail. Since the brief observations made by P. L. Sclater in 1870 ([3]), the only reference found to some of the behavioural patterns of fruit bats, were made by Cowles in his book " Zulu Journal " ([1]) where the notes of Miss A. J. Alexander on a pet epauleted fruit bat are reported.

The 56 species of South African bats recognised by Roberts ([2]) are divided into six families. The relatively large fruit bats which fall under the sub-order Megachiroptera are classified into one family, the Pteropidae, which consists of three genera and four species. Although Roberts states that the Cape Fruit Bat is restricted to the eastern coastal belt from Cape Town northwards to Tanga on the coast of Tanganyika territory, and had not been reported from further inland than King William's Town, the bats concerned in this study were collected very far inland in the Matlapitsi Valley in the Pietersburg district of the Northern Transvaal.

Fruit bats are easily distinguished from the insectivorous species not only by their larger size, but also by virtue of the fact that they have two clawed digits instead of one on each front limb or wing. Their eyes are also larger than those of the Microchiroptera and their ears and noses lack the usual intricate membrane patterns present in their insectivorous counterparts. The long canine features of the fruit bats have earned for them the appropriate name of flying foxes.

Rousettus leachii is the second largest bat occurring in South Africa, the wingspan of adult animals of either sex being between 24 and 25 inches (60-63 cms.) while the total body length is about 5½ inches (14 cms.).

Although they subsist mainly on the fruit of wild figs (*Ficus* spp.), other wild fruit is also taken and fruit farmers sometimes incur losses as a result of raids by swarms of these animals.

The fluctuating populations of this species in some districts would suggest an alimental migration (seasonal search for food). In the Matlapitsi Valley, however, different species of wild figs occur which provide a year round supply of their staple diet and no great migration would occur here.

The large cave in which the Cape Fruit Bats were collected, was inhabited by many thousands of this species as well as by a few much smaller communities of different insectivorous species. As in captivity, the fruit bats clustered together in dense colonies where much screaming, commotion and fighting is carried on in competition for the best holds and most comfortable hanging positions.

It was observed (in captivity) that, out of the mating season which extends from the beginning of June until the middle of September, the larger males tended to form groups of their own, completely ignoring the

gevangenskap, het die vrugtevlermuise in digte klompe of kolonies saamgedrom waar die beste hangplekke deur veel geskree en bakleiery verower word.

Buite die paartyd sonder die groot mannetjies hulleself af en hang nie in die bondel saam met die res van die kolonie nie.

Out of the mating season adult males separate themselves from the rest of the colony.

Dit is opvallend dat die groot mannetjies (in gevangenskap), buite die paartyd, wat duur van Junie tot die middel van September, geneig is om hulle in groepe van die wyfies en kleintjies af te sonder en laasgenoemde heeltemal te ignoreer. Slegs wanneer 'n wyfie of jong mannetjie 'n groot stuk kos in hulle bekke het, word daar van hulle notisie geneem en word hulle daarvan beroof met al die wildheid van 'n gewone geveg.

Hoewel *Rousettus* onderstebo slaap terwyl hy aan albei agterpote hang en die vlerke teenaan die liggaam gevou is, blyk die dier te verkies om as hy slaap net aan een poot te hang met die ander agterpoot dwars oor die voorkant van die liggaam gevou asof die gevoude vlerke daardeur in posisie gehou word (sien buiteblad).

Voordat hulle teen die aand uitvlieg om kos te soek, begin die hele kolonie met hulle daaglikse toilet. In teenstelling met die algemene geloof dat vlermuise vuil diere is, ken ek geen ander soogdier wat soveel aandag aan sy liggaam bestee as dié vrugtevlermuis nie. Die enigste uitwendige parasiete wat op die diere gevind was toe hulle versamel is, was 'n soort miet of „luis" wat slegs op 'n paar diere voorgekom het. Nadat die vlermuise vir 'n paar weke in gevangenskap was, het dit geblyk dat hulle geen uitwendige parasiete meer gedra het nie.

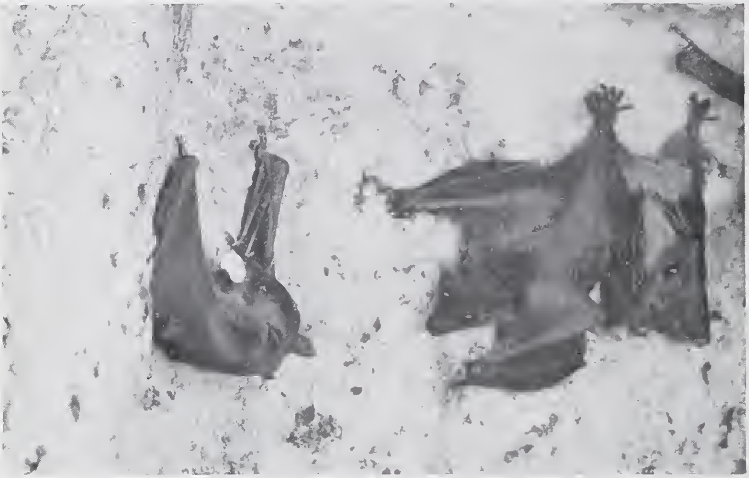
female and juvenile population. Only when a female or younger male had a large portion of fruit in their mouths, were they robbed of it with all the ferocity exhibited in normal fighting.

Although *Rosettus* does sleep hanging upside-down by both hindlegs with the wings folded closely around the body, the most comfortable or preferred position seems to be hanging by one foot of which the claws have been fixed into a small crevice, with the other hindleg folded diagonally across the front of the body, apparently holding the folded wings in position (see cover picture).

Note the wide wingspan of this bat.

Die wye vlerkspan van die vrugtevlermuis kan duidelik in die foto gesien word.

Terwyl die vlermuis aan een agterpoot hang, word sy kop, ore en liggaam met die ander poot gekrap en enige los hare of vuiligheid wat aan die toonnaels vassit word dan weer met die mond verwyder. Behalwe die liggaam, word die vlerke ook van binne en buite skoongelek met die lang beweeglike tong. Die tong is so lank dat die hele gesig en selfs die oë daarmee skoongelek kan word.



'n Vlermuis besig om te eet. Die „ duime " van die vlerk is in die grotdak vasgehak terwyl die voedsel met die agterpoot vasgehou word.

A bat busy eating. The thumbs of the wings are hooked in the roof while the food is held by the hind foot.

As hy wil vlieg, heg die vlermuis albei agterpote stewig aan die grot-wand vas, die rug word agteroor gebuig en die liggaam vorentoe en agtertoe gewieg. Die vlerke word oopgevou en geklap en deur sy houvas aan die dak te los, val die dier dan in vlug.

Die kos is in 'n bakkie op die vloer van die vlermuise se hok geplaas. Hoewel die kos soms direk uit die bak, in die normale viervoetige posisie van soogdiere geëet was, word dit gewoonlik in die mond geneem en klouter of vlieg die vlermuis na 'n geskikte hangplek. Die dier draai dan onderstebo en as die stuk kos klein genoeg is om die bek te vul, vreet die dier in hierdie posisie verder. As die porsie te groot is om in die bek gehou te word, hang die vlermuis net aan een agterpoot en word die voedsel met die ander poot vasgehou net soos 'n hand vir die doel sou gebruik word. Wanneer sulke stukke geëet word, verkies die vlermuis om een of albei duime van die vlerk in die rots te hak sodat die voorste deel van die liggaam feitlik parallel met die grot-dak te staan kom. In hierdie houding word die voedsel dan dikwels op die bors geplaas terwyl die dier eet.

Towards evening the whole colony starts its toilet before flying out in search of food. Contrary to the popular belief that bats are filthy animals, I have known no other mammal to be so meticulous on its person than these fruit bats. The only parasites found on the wild bats was a type of mite, which was present on some of the animals. After being in captivity for a few weeks no external parasites were noticed.

While hanging by one foot, the bat scratches its head, ears or body with the other; any loose hair or dirt that is removed in this way is separated from the toe-nails by the mouth. Apart from the body the wings are also cleaned, inside and out, by licking with the long prehensile tongue. The tongue is so manouevcrable that the entire face and even the eyes can be cleaned by it.

Before falling into flight both hindlegs are firmly attached to the cave roof, the spine is curved backwards and the body swung forwards and backwards. The wings are opened, flapped and the hold is released.

These bats seldom come upright. One such occasion is when they climb a wall. Een van die weinige tye wat die vlermuis „regop" kom is as hy teen die grotwand opklouter.

The food was placed in a tray on the floor of the cage. Although the food is sometimes eaten from the tray while the animal is in the normal quadruped position, it is usually taken in the mouth, after which the animal climbs or flies to a suitable perch. It turns upside-down and if the portion is small enough to fill only the mouth the bat hangs upside-down while eating. Should the portion be too large for the mouth, it is held by one of the hind feet which is used in very much the same way as a human hand. While eating such large portions the bat seems to prefer hooking both its thumbs on to the roof, so that the front part of the body is almost parallel to the cave roof. In this attitude the food is often rested on the chest.

Die wange het kieste, soos dié van 'n bobbejaan, waarin gedeelte van die voedsel gehou word. Die vrugte word deeglik gekou en die sap uitgesuig. In die geval van sagte vrugte soos piesangs, word alles ingesluk, maar as die diere byvoorbeeld vye eet, word die koutjies uitgespoeg.

Die diep groef tussen die twee effens opgehewe neusgate is funksioneel in die sin dat enige oortollige vrugtesap wat uit die mond loop in die groefie afloop sonder dat dit in die neusgate inloop.

As die kleintjies gespeen word, lek hulle die oortollige voedsel wat by die ma se bek uitpeul; dit blyk asof die moeder doelbewus voedsel vir hierdie doel deur haar lippe pers. Op later stadia, sal die kleintjies bekke vol kos uit die moeder se bek neem. Die moeder bring die voedsel na die hangplek waar sy die kleintjie vanaf die begin van sy speentydperk laat. Jonger kleintjies klou aan die moeder se bors vas en word, selfs in vlug, rondgedra. Die twee groot spene sit feitlik onder die armholtes en die kleintjie drink ook in 'n onderstebo posisie.

Dit is interessant dat die vlermuis slegs regop draai om te ontlas of urineer, in welke geval die dier aan sy duime hang. Dit is waargeneem dat ontlasting kan plaasvind binne vyftien minute nadat die diere geëet het. As hulle teen 'n rotswand of boomstam opklim, kom die vlermuise ook in 'n regop posisie.

Nadat hulle geëet het, voer die Kaapse vrugtevlermuise 'n meer uitgebreide toilet uit as wat hierbo beskryf is. Die borshare wat dikwels deur vrugtesap aanmekaar gekoek is, word deeglik met die agterpoot gekam en die tone en toonnaels word met die bek skoongemaak. Die interessantste waarneming in verband met die na-ete toilet, is dat die tande „ gepoets " word. Met die agterpoot krap die vlermuis met sy naels alle stukkies vrugte of vesels van die binne- en buitekant van sy tande af. Die naels word dan ook weer met die voortande skoongeknibbel.

Hoewel die diere wel in gevangenskap gepaar het, is net een kleintjie doodgebore en een verloor deur 'n misgeboorte, sodat geen waarnemings oor die vroeë ouersorg gemaak kon word nie.

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The cheeks have pouches like those of the baboon in which part of the food is held. The fruit is thoroughly chewed and the juice sucked out. In soft fruit like bananas, everything is also swallowed, but when figs are eaten, the sucked out pulp is spat out.

The deep groove between the two slightly elevated nostrils is functional in that it allows any excess fruit juice escaping from the mouth to run down this gulley, preventing entrance into the nostrils.

When the young are being weaned, they will lick the excess fruit protruding from the mother's lips; it would seem as if food is purposely forced through the lips to this end. Later on mouthfuls are taken from the fruit which the mother brings back to the roosting spot where the baby is left after having been weaned. Younger offspring are carried on the chest of the mother, even in flight. The two mammae with relatively large nipples are situated very laterally below the armpits and the young suckle in an upside-down position.

It is interesting to note that the only time the bats come into an upright position is when they turn round to defecate or urinate, when they hang by their thumbs, or when they are climbing up a cave wall or tree trunk. Defecation has been observed to take place in less than fifteen minutes after the bats have fed.

After they have eaten, the fruit bats indulge in a toilet even more elaborate than the one previously described. The hair on the chest, which is sometimes matted by fruit juice is thoroughly combed with a hindfoot and the toes and toe-nails are then cleaned with the mouth. The most interesting observation in this toilet is that the teeth are cleaned inside and out, any bits of fruit or fibre being removed by vigorous scratching between the teeth with the nails of the hindfoot; the latter in its turn being nibbled clean by the front teeth.

Although mating took place in captivity, only one still-birth and a miscarriage occurred, allowing no observations to be made on early parental care.

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CLARIAS, DIE VARSWATERBABER

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DIE baber is waarskynlik die bekendste, maar tegelykertyd sonder twyfel ook die mees onpopulêre vis wat in ons varswater aangetref word. Hoewel dit self nie veel aansien geniet nie, kan dit tog spog met 'n paar vername verwante. Dit behoort aan 'n groep visse wat gesamentlik bekend staan as die platkoppe en is dus verwant aan die groot Wels van die Donou, wat tot 13 voet lank word, asook die welbekende elektriese baber van Sentraal-Afrika. Sommige baber-soorte het gifkliere wat op die stekel van die borsvin open, maar dit wil voorkom asof die slymlaag wat die stekels bedek, self ook baie giftig is, en die stekels veroorsaak pynlike wonde wanneer hierdie visse nie versigtig hanteer word nie. 'n Merkwaardige grot-bewonende baber, *Clarias cavernicola,* met gedegenereerde oë en geen velpigment kom voor in die Aigamasgrot naby Grootfontein in Suidwes-Afrika. Dit is klein en het waarskynlik ontstaan uit 'n soort wat bogronds voorkom ([7]).

Die vooroordeel teen hierdie vis kan grootliks toegeskryf word aan sy onooglike voorkoms. Die kop is groot, afgeplat en goed beskerm deur oppervlakkig-geleë skedelbene. Daar is 4 paar lang voelers, die mond is wyd en die oë onnatuurlik klein. Die tande is baie klein en gerangskik in groepe. Die liggaam is lank en die rug- en anaalvin, wat beide uitsluitlik uit sagte vinstrale bestaan, strek byna tot aan die stertvin. Daar is geen skubbe nie. Mannetjies kan van wyfies onderskei word aan 'n lang, koniese papil wat net agter die anus geleë is, en waarop die geslags- en urinebuise open.

Ten spyte van sy belangrike familie-verband en sy buitegewone grootte, is die baber só traag dat dit van min belang is vir die sporthengelaar. Tog beweer sommige hengelaars dat dit heelwat geduld en vaardigheid verg om 'n groot baber met 'n ligte stok en gereedskap aan wal te bring. Dit kan gevang word met wurms, hoenderderms, paddas, 'n dooie voël of mieliepap en soms byt hulle selfs aan 'n kunsvlieg of lepel. Individue, wat van 30 tot 50 pond weeg, word van tyd tot tyd aangemeld, maar gedurende 1898 is 'n knewel van 130 pond gevang aan die Oranje Vrystaat-kant van die Vaal by Lombardskop naby Christiana ([3]). Dit was langer as 7 vt. en die skedel was byna 24 dm. breed. Die Bantoe wat die vangs gemaak het, het dit verkoop, maar die vleis was oneetbaar omdat dit vol wurmparasiete was. Babers is inderdaad dikwels besmet met parasiete, maar dit is ook waar van die meeste van ons varswatervisse. Die vleis is rooi en nogal taai, en alhoewel 'n groter baber aan tafel nie juis beskou word as 'n lekkerny nie, is visse tot twee of drie pond tog die moeite werd wanneer hulle as viskoekies voorberei word met uie en speserye. Bantoes hou van baber wat hulle òf oor 'n oop vuur braai òf in die son droog vir latere gebruik. Die vleis van die baber is ryk aan olie en in Sentraal-Afrika, waar die droog van vis 'n belangrike industrie uitmaak, is daar 'n groot aanvraag na babers vir hulle olie wat by gedroogde vis gevoeg word om die voedselwaarde te verhoog ([6]).

CLARIAS, THE FRESHWATER BARBEL

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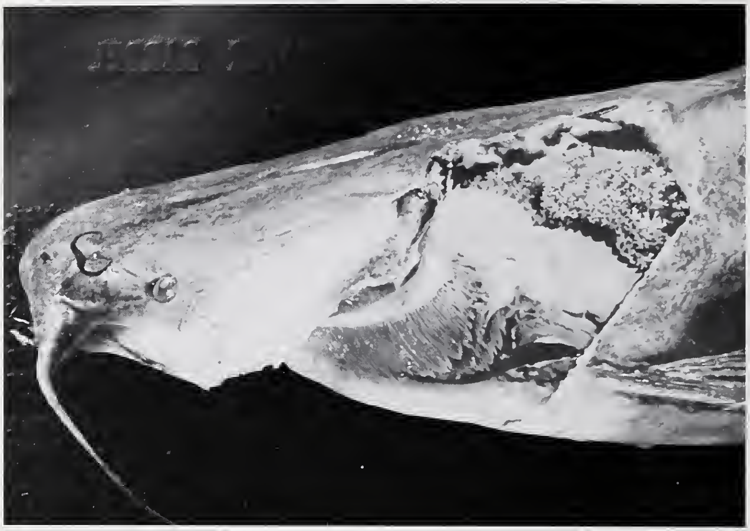
THE barbel is perhaps the best-known, but at the same time undoubtedly the most notorious fish inhabiting our freshwaters. Yet it can boast with some very important relatives even if it is itself not highly esteemed. It belongs to a group of fishes collectively known as the Catfishes and this makes it a relative of the great Wels of the Danube, which reaches a length of 13 feet, as well as the freshwater Electric Catfish of Central Africa. Some Cat-fishes have poison-glands opening on the pectoral spine, but even where these are not present the mucus enveloping the spines appears to be highly toxic, and painful wounds may be inflicted if these fish are handled carelessly. A remarkable cave-dwelling barbel, *Clarias cavernicola,* with degenerated eyes and devoid of skin pigment occurs in the Aigamas Cave near Grootfontein in South West Africa; it is small and has probably originated from a surface-dwelling species (7).

This barbel has just taken in fresh air.
Hierdie baber het so pas vars lug geskep.

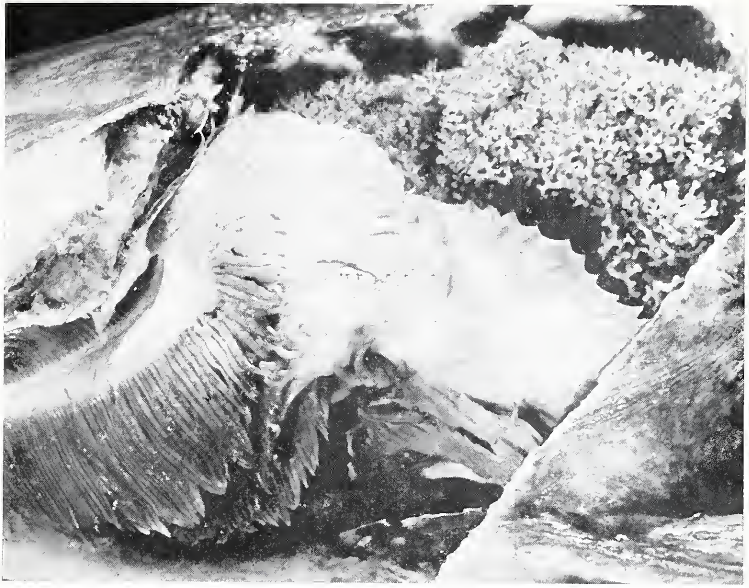


'n Disseksie van die respiratoriese organe om die lugkamer bokant die kieue te toon.
A dissection of the respiratory organs to show the air chamber above the gills.

Die baber is 'n kannibaal, maar origens het dit ook talryke vyande. Sy kleintjies word geëet deur swartbaarse en tiervisse. Dit is 'n betreklike swak swemmer en is 'n maklike prooi vir die otter, soos oorblyfsels wat soms aangetref word langs afgeleë dele van die Vaalrivier, duidelik getuig. Hulle neig om snags vlak water op te soek waar krokodille hulle jag en vang. Gedurende die dag swem babers dikwels na aan die wateroppervlakte rond en word hier deur die waaksame visarend opgeraap om dan stuk vir stuk opgevreet te word terwyl dit nog lewe. Die mens is waarskynlik verantwoordelik vir die grootste aanslag op hulle getalle. Die rekords van een Transvaalse hengelklub toon dat daar oor 'n tydperk van 5 jaar, 907 babers met 'n gewig van 2,864 pd. gevang is teenoor 1,575 geelvis, moddervis en karp wat 3,180 pd. geweeg het. Gedurende die broeiseisoen word hulle in groot getalle doodgeslaan of deursteek terwyl hulle besig is om stroomop te trek of te paar in die oewerplantegroei van damme en riviere.

Waarskynlik as gevolg van hierdie uitdunnende faktore kom die baber selde in sulke getalle voor dat dit 'n bedreiging word of beheermaatreëls in ons Transvaalse hengelwaters noodsaaklik maak. Klagtes oor babers het gewoonlik betrekking op nuwe waters wat nog nie tevore met hengelsoorte bevolk is nie. Die ekologie van hierdie dier is nog swak bekend maar ons waarnemings dui daarop dat klein *Barbus*-soorte (ghilliemientjies), die kanariekurper (*Chetia flaviventris*) en die vleikurper (*Tilapia sparrmanii*) almal 'n baie belangrike rol speel om die getal babers in sekere Transvaalse waters te beperk, waarskynlik deur die eiers of die jong vissies te vreet.

Daar is al dikwels berig dat pas-voltooide damme, wat nie direk met 'n stroom of 'n ander dam verbind is nie, spoedig bevolk raak met babers, en daar is aangeneem dat hierdie visse swaar dou of nat grond benut om kort distansies oorland van een water na die ander af te lê. Hierdie



A close-up of the dissected area.
Upper right: Dendritic organs. *Middle:* Fan-like structures with little hooks. *Lower left:* First gill-arch with filaments at the back and gill-rakers at the front.

'n Naby-opname van die gedissekteerde area.
Regs bo: Dendritiese organe. *Middel:* Waaiervormige strukture met hakies. *Links onder:* Eerste kieuboog met filamente aan agterkant en siftandjies aan voorkant.

To a great extent the prejudice against this fish may be ascribed to its ungraceful appearance. The head is large, flat and heavily armoured with superficial skull bones. There are 4 pairs of long barbels, the mouth is wide and the eyes are unnaturally small. The teeth are minute and are arranged in bands. The body is elongated and the dorsal and anal fin, which are both composed entirely of soft rays, extend nearly to the well-developed tail fin. There are no scales. Males can be distinguished from females by the long, conical papilla, which is situated just behind the vent, and on which the oviduct and ureters open.

In spite of its notable family connections and the fact that it is our largest freshwater fish, the barbel is so sluggish that it is of little interest to the sport-fisherman. Nevertheless some anglers do claim that it requires considerable patience and skill to land a heavy barbel on a light rod and tackle. It may be caught on worms, chicken gut, frogs, a dead bird or mealie meal and sometimes they will even take the wet fly or spoon. Individuals weighing 30-50 pounds are being reported from time to time, but during 1898 a monster weighing 130 lb. was caught on the Orange Free State side of the Vaal at Lombard's Kop near Christiana ([3]). It was over 7 ft. in length and the skull measured nearly 24 inches across.

verklaring vir die geheimsinnige manier waarop nuwe damme bevolk word, mag tot 'n sekere mate waar wees maar enigeen wat al gesien het op watter dwalende en ietwat pynlike manier 'n baber, wat op die oewer uitgegooi is, poog om na die water terug te spartel, sal saamstem dat 'n reis van etlike myle oorland na 'n nuwe water onmoontlik is. 'n Ander teorie wil dat die pasbevrugte eiers na 'n ander water oorgedra word terwyl dit vaskleef aan die bek of pote van eende en ander watervoëls. 'n Meer aanneemlike verklaring vir hierdie verskynsel is moontlik dat 'n bepaalde dam met baber-vingerlinge bevolk word na 'n swaar reën, wanneer selfs 'n swak oorloop voldoende sal wees om aan hulle toegang te verleen.

Die besoeker aan die Provinsiale Vissery-instituut wat op sy tyd die baber dophou wat in die F. C. Braun-Akwarium uitgestal word, sal oplet hoe dit groot lugborrels uit sy kieu-kamers loslaat net voordat dit opkom om 'n mondvol vars lug te neem. Die baber is 'n vis en haal asem met kieue, maar daar is ook 'n spesiale lugkamer bokant die kieue wat in werklikheid 'n uitbreiding van die kieu-kamer is. Die lugkamer bevat bykomstige respiratoriese strukture, die sogenaamde dendritiese organe, waarvan daar twee aan elke kant is. Die weefsel waarmee die dendritiese kamer uitgevoer is, is ryklik voorsien van bloedvate en die ingang tot elke kamer word beheer deur vier waaiervormige strukture (1). Hierdie kamers dien die kieue deur te funksioneer as 'n soort van long, en lug wat deur die mond ingeneem word, word hier gebêre. 'n Baber, wat in water gehou word wat te min suurstof bevat vir doeltreffende kieu-asemhaling, sal „versmoor" wanneer dit verhinder word om toegang tot die wateroppervlakte te verkry. Dit is 'n baie geharde vis en sy taaiheid het dit die suksesvolle soort gemaak wat dit vandag is. Die besit van hierdie respiratoriese organe het ongetwyfeld veel daartoe bygedra en dit stel die baber in staat om in vuil water, wat ongeskik is vir meeste ander soorte, te lewe. Die baber kan so lank as 24 uur buite water lewe deur van hulle gebruik te maak. Wanneer 'n baber opkom om lug te skep is dit meer 'n stadige rolbeweging, en die oplettende hengelaar leer gou om te onderskei tussen die manier waarop 'n baber of 'n geelvis en forel water breek.

Die baber word algemeen beskou as 'n roofvis en 'n aasdier, maar 'n studie van sy voedingsgewoontes in Transvaalse waters het aan die lig gebring dat, alhoewel dit 'n uitgesproke kannibaal is, dit egter ook van mikroskopiese plankton-organismes kan leef as daar geen ander voedsel beskikbaar is nie. Die hoeveelheid vis, insekte en plankton wat gevreet word, word bepaal deur die verhouding waarin hierdie voedselsoorte in die verskillende omgewings voorkom, en vis is nie noodwendig die mees belangrike item in die dieet nie. Vis en plankton, in min of meer ewegroot hoeveelhede, is die belangrikste voedsel van babers in damme, alleenlik klein hoeveelhede insekte word gevreet en min plantmateriaal kom in die maaginhoud voor. Babers wat riviere bewoon se voedsel bestaan hoofsaaklik uit waterlewende en landinsekte.

As roofvis is die baber besonder goed toegerus met 'n wye mond en 'n individu wat 49 dm. lank is en 32 pd. weeg kan met gemak 'n ander baber insluk wat 24 dm. lank is en ongeveer 4 pd. weeg. Aan die ander kant kan 'n baber van dieselfde grootte ewe gelukkig lewe in die afwesigheid van 'n voervis deur homself knuppeldik te vreet aan byna mikroskopiese plankton-organismes, wat uit die water gesif word met behulp van die kieu-siftandjies op die kieu-boë. In meeste ander roofvisse is slegs die kleintjies plankton-vretend, en vir sy voedselbehoeftes is die baber dus goed aangepas aan 'n groot verskeidenheid van omgewingstoestande. As

The Bantu who made the catch sold it, but the flesh could not be eaten as it was found to be full of worm parasites. Barbel are indeed very often infested with parasites, but this also applies to other freshwater fishes. The flesh is reddish and rather tough, and although a large barbel is not exactly prized as a table delicacy, fish up to two or three pounds are quite good eating when they are made up into fish-cakes with onions and herbs. Natives are very fond of barbel, which they either roast over an open fire or sun-dry. The meat of the barbel is very rich in oil and in Central Africa, where dried fish is an important industry, barbel are in great demand for their oil is poured over dried fish in order to improve its food value (6).

The barbel is cannibalistic, but on the other hand it also has numerous enemies. Its young are eaten by Black-bass and Tigerfish. It is a rather poor swimmer and falls an easy prey to the otter, as the remains, which are sometimes found on remote parts of Vaal River, clearly testify. They tend to come into the shallow water at night where they are hunted and caught by crocodiles. During day-time barbel often swim around below the surface of the water where they are grabbed by the ever-watchful fish eagle and eaten while still alive. The greatest onslaught on their numbers probably comes from man himself. The records of one Transvaal angling club shows that 907 barbel weighing 2,864 lb. were caught during a period of 5 years against 1,575 yellowfish, mudfish and carp with a weight of 3,180 lb. During the breeding season they are clubbed or speared in large numbers while migrating upstream or spawning in the marginal vegetation of dams and streams.

Probably as a result of these decimating factors the barbel is seldom present in such numbers as to present a serious menace or to necessitate measures of control in our Transvaal angling waters. Complaints about barbel are usually associated with new impoundments which have never before been stocked with angling species. The ecology of this animal is not well understood but our observations indicate that small species of *Barbus* (minnows), the Canary Kurper (*Chetia flaviventris*) and the Vlei kurper (*Tilapia sparrmanii*) all play a very important rôle in reducing the number of barbel in certain Transvaal waters, possibly by consuming the eggs or the young fish.

It has been reported very often that newly-completed dams which are not directly connected with a stream or another pond are soon populated with barbel, and it has been thought that these fish take advantage of heavy dew or wet ground to travel short distances overland from one water to the other. This explanation for the mysterious manner in which new ponds have been populated may be true to some extent, but anyone who has observed the erratic and rather painful way in which a stranded barbel attempts to struggle back to the water will agree that a land journey of several miles to a virgin water is out of the question. Another theory has been advanced that the freshly-spawned eggs are carried to another water while clinging to the feet and bills of ducks and other waterfowl. However, a more plausible explanation for this phenomenon seems to be that a particular water is populated with fingerling barbel after a heavy rain when even a very shallow overflow is sufficient to allow for their passage.

'n aasdier vreet dit enige ander beskikbare voedsel. Byvoorbeeld swaeltjies, wat tussen riete wat in vlak water groei slaap val dikwels van hulle onsekere slaapplekke, en is dan 'n goeie maaltyd vir babers wat waarskynlik na die plek gelok word deur die mis van die voëls. In Loskopdam neig *Clarias* ook om te vergader by die dooie bome waarin witborsduikers besig is om te broei, en hulle vreet die bebroeide eiers, kuikens en uitgebraakte vis wat deur die voëls laat val word. Die beperkte gegewens wat op die oomblik beskikbaar is, laat 'n mens dink dat die baber glad nie so 'n aggressiewe roofvis is as wat algemeen aangeneem word nie, en 'n groot deel van sy dieet bestaan uit voedsel wat andersins as 'n natuurlike afval verlore sou gegaan het.

Die voelers van die vis is goed voorsien van smaakknoppies en hulle fungeer in werklikheid as smaakorgane. Visse met sulke lang voelers voed egter op 'n heel ander manier as visse met kort voelers (9). By karp en geelvis, wat beide kort voelers het, is die smaakknoppies hoofsaaklik gekonsentreer in die verhemelte. Hierdie soorte neem dus eers hulle voedsel in die mond, proe dit en oneetbare deeltjies word dan na buite gewerp deur die mond of kieu-splete. Die baber, daarenteen, maak minder op sy oë en meer op sy 4 paar lang voelers staat om sy voedsel op te spoor en met hulle word elke brokkie eers ondersoek (geproe) voordat dit opgeneem en gesluk word.

In sommige Transvaalse damme teel die baber vinnig aan, maar om een of ander rede wat op die oomblik nie met sekerheid bekend is nie, slaag hulle in ander damme weer nie daarin nie. Uit toevallige waarnemings weet ons dat die baber in damme en riviere tussen waterplante soos *Potamogeton* broei. Die eiers is vasklewend en heelwat groter as dié van die moddervis of geelvis. Die eierstokke van 'n wyfie van 19 dm. bevat ongeveer 8,000 eiers, en dié van 'n 40 dm. wyfie ongeveer 120,000. Origens was daar baie min bekend omtrent die voortplanting van *Clarias*, maar in 1955 het Greenwood (4) vir die eerste keer die eiers, embrios en larwes beskryf uit Victoria-meer. Hy het die bevrugte eiers in klein groepies van 5-10 tussen plantmateriaal op die bodem gevind. Die eiers se deursnit was ongeveer 2 mm. en rondom die een pool was daar 'n groot skyf, waarmee die eier aan die substraat geheg word, en hulle het van 23 tot 25 uur geneem om uit te broei. Toe hulle uitgebroei het was die larwes 3·5 -4 mm. lank en het 'n klein ventrale kleeforgaan gehad. Voelers was alreeds teenwoordig op hierdie vroeë stadium en besonder lank. Na vier dae was daar geen teken meer van die dooiersak en ventrale kleeforgaan nie, en die larwes was duidelik herkenbaar as jong babertjies. Die snelheid waarmee embrionale en larwale ontwikkeling voltooi is, is 'n verdere aanpassing aan ongunstige omgewingstoestande.

Alhoewel *Clarias* deur die meeste hengelaars met minagting en afkeur betrag word, het dit tog sekere uitstaande eienskappe wat dit moontlik geskik maak vir teel-doeleindes, soos sy gehardheid en vermoë om gebruik te maak van 'n groot verskeidenheid voedselsoorte. Sy voedingsgewoontes behoort deegliker en op 'n vergelykende basis met dié van ander soorte bestudeer te word, en dit is glad nie onmoontlik dat so 'n studie sal toon dat dit wel in produksie-damme gebruik kan word om daardie voedselsoorte te benut wat nie deur die ander soorte geëet word nie. Wanneer daarin geslaag is om die baber suksesvol te teel kan dit oorweeg word om sekere waters te bevolk en later te ontgin.

In die nabye toekoms mag hierdie swartskaap van ons varswatervisse wel nog 'n veel belangriker rol speel om proteïnes te verskaf aan die ondervoede miljoene van Afrika.

The visitor to the Provincial Fisheries Institute who takes time watching the barbel exhibited in the F. C. Braun Aquarium will observe how it releases large bubbles of air from its gill-chambers just before it surfaces to take another mouth-full of fresh air. Being a fish the barbel breathes with gills, but it also has a special air-chamber above the gills. This is in fact an expansion of the gill-chamber and contains accessory respiratory structures called the dendritic organs of which there are two on each side. The lining of the dendritic chamber is richly supplied with blood vessels and the entrance to each chamber is guarded by four fan-like structures. These chambers subserve the gills by acting as a sort of lung, and the air which is taken in through the mouth is stored here. A barbel, which is kept in water containing insufficient oxygen for effective gill respiration, will " suffocate " if it is prevented from gaining access to the surface. It is a very hardy fish and its tenacity of life has made it the very successful species it is today. These respiratory organs undoubtedly contributes towards this end and enables the barbel to live in foul waters which are unsuitable to most other species. With their aid it stays alive out of water for as long as 24 hours. When a barbel rises for air it does so more with a roll than a rise and the observant angler soon learns to distinguish between the rise of a barbel and that of a yellowfish or trout.

The barbel is generally regarded as a predator and a scavenger, but a study of its food habits in Transvaal waters has disclosed that it is a notorious cannibal, which also feeds on almost microscopic plankton organisms when no other food is available. The quantities of fish, insects and plankton consumed are determined by the proportion in which these are present in the different habitats, and fish is not always the most important item in the diet. Fish and plankton, in more or less equal quantities, is the most important food items in the diet of barbel living in dams; only small quantities of insects are eaten and very little plant detritus is present. Barbel inhabiting rivers feed mainly on aquatic and terrestrial insects.

With its wide mouth the barbel is well-equipped for a predatory way of life, and an individual 49 inches long and weighing 32 pounds may easily swallow another barbel 24 inches in length and weighing approximately 4 pounds. On the other hand a barbel of similar size may also live quite contentedly in the absence of forage-fish by gorging itself on plankton organisms strained from the water with the aid of the numerous and very fine gill-rakers on its gill-arches. In most other predatory species only the young fish are plankton feeders, and for its food requirements the barbel is consequently well-adapted to a wide range of environmental conditions. As a scavenger it accepts any other food that comes its way. For instance, swallows spending the night in the reeds growing in shallow water become dislodged from their rather precarious roosts only to provide a good meal to barbel which are probably attracted to the site by the excrement of the birds. At Loskop Dam *Clarias* also tend to congregate around the dead trees where cormorants are breeding and they feed on unhatched eggs, fledglings and regurgitated fish dropped by these birds. The limited data available at the moment suggest that the barbel is not the aggressive predator it is believed to be, and a great part of its diet consists of food that would otherwise disappear as a natural waste.

The barbels of fish are well supplied with taste buds and these whiskers do in fact function as organs of taste. However, fish with long barbels feed in quite a different way from fish with short barbels ([9]). In carp and

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yellowfish, which have short barbels, the taste buds are concentrated on the palate. These species consequently first take their food into the mouth, taste it and then reject all inedible particles through the mouth or gill-slits. The barbel, on the other hand, depends less on its eyes and more on its 4 pairs of long barbels to locate its food, and with their aid every morsel is first examined (tasted) before it is taken up and swallowed.

In some Transvaal dams barbel breed rapidly, while in others they fail to do so for some reason not definitely known at present. From casual observation we know that in dams and rivers barbel spawn among water-plants like *Potamogeton*. The eggs are adhesive and considerably larger than that of mudfish or yellowfish. The ovaries of a female of 19 inches contain about 8,000 ova and that of a 40 inch female approximately 120,000. Otherwise very little was known about the reproduction of *Clarias*, until Greenwood (4) first described the eggs, embryos and larvae from Lake Victoria in 1955. He found the fertilized eggs in small groups of 5-10 among accumulated plant debris. The eggs which were about 2 mm. in diameter had a large adhesive disc around one pole and hatched after twenty-three to twenty-five hours. On hatching the larvae were 3·5 -4 mm. long and had a small ventral adhesive organ. Barbels are already developed and quite long at this early stage. After four days the yolk sac and ventral sucker disappeared and the larvae were clearly recognizable as young barbel. The speed with which the embryonic and larval development is completed is yet another adaptation to an unfavourable environment.

Although *Clarias* is viewed with contempt and aversion by many anglers it has some outstanding characteristics such as its hardiness and its ability to thrive on a wide range of food items, which could make it a suitable fish to breed and propagate. Its feeding habits should be studied more intensively on a comparative basis with that of other species inhabiting the same water. This might prove that it can also be used in production ponds to crop those food items which are not exploited by other species. If the barbel can be bred successfully the possibility of stocking and cropping certain waters should be considered.

In time to come this " black sheep " amongst our freshwater fishes may perhaps play an important rôle in the production of proteins for the starving millions of Africa.

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DIE AANHOU VAN WILDE DIERE

W. K. Kettlitz

„Geagte Meneer,

Ek het 'n klein leeutjie in Noord-Transvaal gevang en dié is nou sowat 6 - 8 maande oud. Nou was die Natuurbewaringsbeampte vandag hier by my en sê dat ek die leeu nie mag aanhou nie . . ."

„Waarde Heer,

Die mense wat in Smithstraat 53 net agter ons bly, het 'n jong leeu wat hulle in 'n hok van 5 vt. lank en 4 vt. wyd aanhou.

Ek verstaan dat mens leeus nie mag aanhou nie, veral nie in sulke swak hokke nie. Die leeu lyk vir my ook maar baie maer en ondervoed . . ."

So skryf hulle van jaar tot jaar, want sommige mense besit 'n ingebore neiging om allerhande soorte wilde diere mak te maak en in hulle agterplase aan te hou, tot ergernis van andere wat dit as wreedheid bestempel. Sommige hou wilde diere aan omdat hulle daardeur uiting aan hulle liefde vir diere wil gee, terwyl andere weer hulle vriende wil imponeer of geld probeer maak. Hoe dit ookal sy, niemand bewys enige wilde dier 'n guns deur dit in gevangenskap aan te hou nie.

Onlangs het 'n mediese dokter wat om halfvier in die oggend op pad was na 'n bevalling, tot sy groot verbasing 'n ietermagog in een van Pretoria se strate raakgeloop. Hierdie seldsame dier sal homself nooit vrywilliglik in 'n stad begewe nie en kon slegs uit gevangenskap ontsnap het. Niemand het nog ooit daarin geslaag om 'n ietermagog in gevangenskap aan die lewe te hou nie, om die eenvoudige rede dat dit van rysmiere lewe en baie skugter is.

Dieselfde lot tref meeste wilde diere wat in hokke aangehou word: aanvanklik is dit 'n groot aardigheid om 'n leeu, nagapie of wildsbokkie te besit, maar omdat baie min mense enige kennis van die voedings- en behuisingsbehoeftes van sulke diere het, loop dinge mettertyd skeef.

Bokkies wat in gevangenskap aangehou word, het gewoonlik 'n treurige uiteinde. Deurdat hulle hul vrees vir die mens en huisdiere verloor, maak hulle soms amok. 'n Duikerram kan kinders en grootmense geweldige wonde toedien en selfs vermink, of hulle gaan vol vertroue na 'n gewetenlose nagjagter wat hulle daar en dan doodskiet, of hulle word deur die bure se hond verslind, of hulle ontwikkel siektes soos kaakswere en moet uiteindelik vernietig word. In werklikheid is dit nie die moeite werd om hulle aan te hou nie, en terselfdertyd is hierdie bokkies vir die natuur verlore.

KEEPING OF ANIMALS IN CAPTIVITY

W. K. Kettlitz

" Dear Sir,

I have caught a lion cub, 6 to 8 months old, in Northern Transvaal. Now the Nature Conservation Officer was here today and told me that I may not keep the animal . . . "

" DEAR SIR,

The people living at 53 Smit Street, just behind us, have a young lion which they keep in a cage of 5 ft. long by 4 ft. wide.

I understand that people may not keep lions, especially in such poor cages. To me this lion looks very thin and underfed ... ... "

This kind of letter is received from year to year, because some people seem to have an inborn fancy for keeping all kinds of wild animals in captivity in their back-yards to the annoyance of others who regard it as cruelty to animals.

Recently a medical doctor, on his way to attend to a childbirth at half past three in the morning, to his great astonishment came across a scaly anteater in a street in Pretoria. This rare animal will never venture into a city out of its own free will, and could only have escaped from captivity. Nobody has ever succeeded in keeping a scaly anteater in captivity on account of its specialised diet of termites and its shy nature.

Most wild animals kept in cages by private persons meet with the same fate. At first it is great fun to have a lion cub, a bushbaby or a little buck, but because of the general ignorance about the feeding and housing requirements of these animals, matters usually go wrong.

Buck in captivity usually meet with a sad fate. Because they lose all fear of man and domestic animals they often run amuck. A duiker ram can inflict severe wounds to children and even adults, or it may confidently walk up to a ruthless night hunter who shoots it. Many tame duiker are devoured by the neighbour's dogs or they develop ailments like jaw ulcers and have to be destroyed. In fact it is not worth keeping such animals and at the same time they are lost to nature.

There are other animals which are dangerous in captivity. Some hunters are fond of capturing the cubs of lions, leopards or cheetahs and they even regard this as deeds of bravery.

After these animals have been caught the trouble starts. They have to eat and the brave catcher soon discovers that they are expensive pets. Those that have not by then died from wrong, over- or underfeeding are now palmed off on an " animal lover " or self-styled " big game hunters " who use these wretched animals for photographic purposes.

Dan is daar nog ander soorte wildediere wat 'n gevaar vir mense inhou. Soveel jagters is geneig om klein leeutjies, luiperdwelpies en jagluiperds te vang en dit dan selfs as 'n kordaatstuk te beskou.

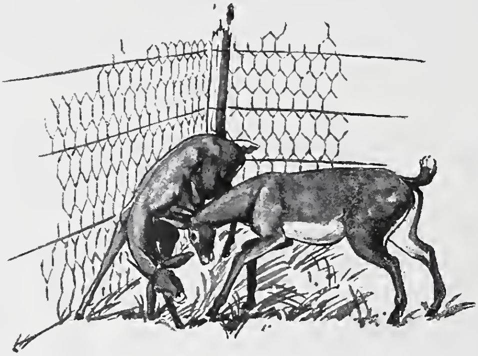
As hierdie diere eers gevang is, dan begin die moeilikheid. Hulle moet eet en drink. Die brawe vanger van die welpie vind nou uit dat hulle geld uit sy sak jaag en die welpie wat teen hierdie tyd nie alreeds dood is van te min, te veel of verkeerde voeding nie, word dan afgesmeer aan 'n „ liefhebber " of aan die „ grootwildjagters " wat hierdie diere vir fotografiese doeleindes gebruik.

Teen die tyd dat hierdie diere ses maande oud is, is hulle reeds gevaarlik. Die eienaar beweer altyd dat die dier hondmak is en niemand lastig val nie. So het daar verskeie voorvalle plaasgevind waar mense deur sulke mak diere vermink en selfs gedood is. As gevolg hiervan is dit noodsaaklik geag om die aanhou van sulke diere te beheer. Permitte word derhalwe slegs aan persone uitgereik wat beskik oor goedgekeurde hokke, waaruit die diere nie kan ontsnap nie, of waarin geen mens kan kom nie.

Sulke diere is ook verlore vir die natuur en die bewering dat hulle aangehou word uit liefde vir die natuur, is natuurlik gebaseer op 'n wanbegrip.

Natuurbewaring beoog, nie net in die Transvaal nie, maar dwarsdeur die wêreld, die behoud en benutting van plante en diere *in hul natuurlike staat*.

Diere wat in gevangenskap aangehou word, het alleenlik waarde waar hulle in openbare dieretuine aangehou word en 'n besliste opvoedkundige funksie vervul waardeur natuurbewaring direk of indirek bevorder word. Diere wat deur private persone aangehou word, vervul geen van die genoemde funksies nie. Hulle is vir die saak van natuurbewaring verlore en dien slegs 'n selfsugtige liefhebbery.



Daar bestaan ook gewetenlose persone wat die liefhebbery van diere (wat geensins natuurbewaring is nie) uitbuit deur allerhande diere uit die natuur te neem en te verkoop aan persone wat hulle dan in gevangenskap aanhou. Hierdie mense beroof dus die natuur vir eie gewin, en kan die verdwyning van bepaalde soorte veroorsaak as daar nie streng opgetree word nie.

Although the owner will invariably state that his pet is as tame as a dog, these carnivores are already dangerous at the age of 6 months.

After various people got mutilated and even killed by such pets the keeping of certain dangerous animals in captivity was made subject to a permit. Such permits are only issued to persons who have suitable cages out of which the animals cannot escape and which no unauthorised person can enter.

Such animals are naturally also lost to nature and the idea that they are kept out of love for nature is based on a misconception. Not only in Transvaal, but throughout the world nature conservation aims at conserving and utilising plants and animals in their natural state.

Animals in captivity only have value when kept in public zoos where they fulfil a definite educational function whereby the cause of nature conservation is directly or indirectly promoted. Animals kept by private persons do not fulfil any of the above functions but only serve a selfish fancy.

There are unscrupulous persons who exploit other people's love of animals (which must not be confused with nature conservation) by catching wild animals and selling them to such persons. They are exploiting nature for their personal gain and, unless strict measures are taken, they may cause the disappearance of certain species.

Private zoos are therefore discouraged as far as possible, because they are really only a selfish manifestation of love of animals and are of absolutely no value to nature conservation. On the contrary it is harmful to conservation and only serves certain personal cravings and interests. It is condemned and suppressed as far as possible in all civilised countries.

The distribution and encouragement of game animals in their natural habitat where they can live a natural life and where man can utilise them properly is encouraged. Thus people who wish to restock

Private dieretuine word dus deur die Administrasie sover moontlik ontmoedig omdat dit 'n selfsugtige manier is om aan diereliefde uiting te gee en dit geen waarde vir natuurbewaring inhou nie. Inteendeel, dit doen afbreuk aan alle pogings van bewaring en dien slegs om sekere persoonlike drange en belange te bevredig. Dit word in alle beskaafde lande sover moontlik afgekeur en onderdruk.

Die verspreiding en bevordering van wild in die natuur, waar die diere hulle natuurlike lewe en drange kan uitleef en voorplant om deur die mens in die natuurlike staat benuttig te word, word natuurlik aangemoedig. Persone wat weer hulle plase van wild wil voorsien (nie om in klein kampies of in hokke aan te hou nie) kan sekere wildsoorte van die Afdeling Natuurbewaring koop.

Die Wildordonnansie No. 23 van 1949 omskryf 'n wilde dier as:

> „enige werweldier ('n voël inbegrepe) hetsy in gevangenis of elders gehou of geteel, behorende tot 'n soort wat nie 'n soort huisdier is nie en waarvan die natuurlike tuiste òf tydelik òf voortdurend in enige deel van die Republiek of die gebied Suidwes-Afrika is ".

In terme van Hoofstuk VI van die Wildregulasies, word die aanhou en vervoer van Suid-Afrikaanse voëls, alle wild wat op die eerste en tweede bylae van die Ordonnansie verskyn en sekere wilde diere naamlik leeus, luiperds, jagluiperds en krokodille, verbied, tensy die houer in besit van 'n geldige permit van die Administrateur is.

Omdat meeste van ons onder wild slegs wildsbokke verstaan, is dit van belang om daarop te let dat die term wild, behalwe 'n aantal voëlsoorte, ook die nagapie, bosapie, maanhaarjakkals, krimpvarkie, ietermagog, erdvark, skilpaaie, ouvolk ('n soort akkedis) en die groot-klipakkedis insluit.

Dit is dus duidelik dat dit verbode is om enige inheemse wild, of enige inheemse voël asook 'n leeu, luiperd, jagluiperd of krokodil sonder 'n permit in gevangenskap te hou of te vervoer.

As u dus uit jammerte vir die diertjie lus voel om 'n nagapie van 'n klonkie langs die grootpad te koop, rapporteer dit liewer aan die naaste polisie, want u sal net vir uself moeilikheid koop. As die klonkie een nagapie aan u verkoop het, moedig dit hom aan hom nog meer te gaan vang en daardeur help u, ten spyte van u goeie bedoelings, om die nagapies uit te roei.

Die aanhou van voëltjies in hokke is 'n baie gewilde stokperdjie. Beide uitheemse en inheemse voëltjies word hiervoor gebruik. Die kleurryke klein saadvretende voëltjies van die Transvaalse bosveld is besonder gesog onder voëlliefhebbers, beide hier en oorsee. Dit het daartoe gelei dat gewetenlose voëlvangers in die verlede duisende van hierdie voëltjies gevang het om plaaslik sowel as oorsee te verkoop. Die meerderheid van die voëltjies wat so gevang word, gaan dood en dit is te verstane dat sulke mense die voëllewe 'n geweldige knou kan gee.

Dit is moeilik om die voëlvanger op heterdaad te betrap en daarom was dit noodsaaklik om ook die aanhou van inheemse kouvoëls deur 'n permitstelsel te beheer. Permitte om voëls te vang word nou slegs aan erkende opvoedkundige en wetenskaplike inrigtings uitgereik. Persone wat voor die inwerkingtreding van die regulasies in besit van Suid-Afrikaanse voëls was, is van 'n permit voorsien vir die soorte en getalle wat

their farms with game can buy certain antelopes from the Division of Nature Conservation. Game are however not supplied for keeping in small paddocks or in captivity.

The Game Ordinance (No. 23 of 1949) defines a wild animal as—

> "any vertebrate animal (including a bird) whether kept or bred in captivity or elsewhere, belonging to a non-domestic species whose habitat is either temporarily or permanently in any part of the Republic or the territory of South West Africa".

In terms of Chapter VI of the Game Regulations a permit is required for the keeping and transport of all South African birds, all game included in the first and second schedules to the Ordinance as well as certain wild animals namely lions, leopards, cheetahs and crocodiles.

Because to most of us game means only antelopes it must be noted that the term "game" includes, apart from certain birds, the night ape, bushbaby, aardwolf, hedgehog, scaly anteater, antbear, all tortoises, giant girdled lizard and the giant rock lizard.

To summarize, it is illegal to keep or transport any indigenous game animal, bird, lion, leopard, cheetah or crocodile without a permit.

If you feel like buying a night ape from a bantu boy along the main road, out of compassion for the poor little creature, rather report it to the nearest Police or Nature Conservation Officer because you will only be buying a lot of trouble. If this bantu boy is successful in selling one night ape it encourages him to catch more and thus you will, in spite of your noble intentions help to exterminate the night apes.

The keeping of both exotic and indigenous cage birds is a very popular hobby. The colourful little seedeaters of the Transvaal bushveld are particularly sought after by both local and overseas bird-fanciers. This led to the large-scale capture of these birds by unscrupulous bird catchers for local and overseas markets. Most of the birds caught in this manner die and one can imagine how this practice depleted these birds.

It is difficult to catch the bird catcher red-handed and the only way to stop him was to control the keeping and transport of birds through a permit system. Permits for catching birds are now only issued to recognised scientific and educational institutions. Persons who possessed

in hulle besit was. Dit was deur die Afdeling Natuurbewaring in oorleg met die Voëlklubs besluit dat 6 paar van elke soort meer as voldoende is om enige liefhebber se benodigdhede te bevredig. Uit hierdie ses pare (12 voëls) van 'n soort kan hy dan teel en die surplus voëls kan aan ander voëlliefhebbers afgestaan word (onder dekking van 'n permit) om dan op dié manier die voëls wat reeds in gevangenskap verkeer, te versprei en te propageer, sonder om verder uit die natuur vir die doel te put. Op hierdie manier word die inheemse voëls wat in voëlliefhebbers se hokke voorkom, beperk tot daardie soorte wat wel in gevangenskap aanteel. Vir die aanhou van uitheemse voëltjies is geen permit nodig nie.

Die lewe van enige wilde dier in gevangenskap is selfs onder die beste omstandighede pateties, en kan slegs vir opvoedkundige en wetenskaplike doeleindes geregverdig word. Enigiemand wat 'n wilde dier wil aanhou, moet homself eers afvra op welke gronde so 'n daad goedgepraat kan word.

South African birds at the time of the promulgation of the regulations were issued with permits for the species in their possession. The Division of Nature Conservation, in consultation with the cage bird clubs decided that 6 pairs of a species were more than adequate for any bird-fancier. By disposing of the offspring of these birds to other bird-fanciers, the birds already in captivity are distributed (under cover of permit) and the necessity for exploiting wild birds falls away.

In this manner the South African cage birds legally in captivity are restricted to those species that will breed in captivity. No permit is required for keeping exotic birds.

The life of any wild animal in captivity is, even under the best of circumstances pathetic and can only be justified for scientific and educational purposes. Anybody who wishes to keep a wild animal must first ask himself on what grounds such an act can be justified.

DIE VOËLRESERVAAT EN NAVORSINGSTASIE BARBERSPAN

Dr. T. Farkas

ONDER die reservate en navorsingstasies van die Afdeling Natuurbewaring van Transvaal is die stasie te Barberspan een van die kleinste en jongste. Dié reservaat is in die jaar 1951 op 'n oppervlakte van ongeveer 400 morg gestig om die indrukwekkende voëllewe hier te beskerm en sover moontlik ook te bestudeer. Dit was geen toeval dat die keuse juis op hierdie verafgeleë plek geval het nie, daar Barberspan altyd baie bekend was vir sy rykdom aan voëls. Die bekendheid van Barberspan het sedert die stigting van dié reservaat steeds toegeneem en het dikwels ook deskundiges vanuit Europa en Amerika, wat graag hul kennis oor Suid-Afrikaanse voëllewe hier wou uitbrei, hierheen getrek. Dus kan dit ook vir ons lonend wees om met hierdie kosbare gedeelte van die Suid-Afrikaanse toneel 'n bietjie nader kennis te maak en om oor die arbeid en doelstellings van dié stasie net kortliks ingelig te word.

Barberspan en die van hom slegs deur 'n lae heuweltjie afgeskeie Leeupan, lê in die sentrale buiging van 'n tektoniese barsting wat min of meer noordwes na suidoos loop en 'n reeks soortgelyke vlak panne bevat. Maar die grootste verskil tussen al hierdie panne en Barberspan is dat slegs Barberspan permanent water bevat. Leeupan, wat by 'n normale waterstand hoogstens 3 m. diep is, kan in geval van aanhoudende droogte totaal opdroog (wat juis vanaf November 1959 tot Maart 1961 die posisie was); maar in reënjare kan 'n direkte verbinding tussen die twee panne ontstaan. Barberspan kan sy watertoevoer op twee maniere verkry; eerstens deur die periodieke Hartzrivier wat in die reëntyd deur 'n sytak in die pan inloop. Tweedens word die pan waarskynlik ook deur fonteine op die panbodem gevoed. Slegs baie selde, na jarelange aanhoudende droogte, kan dit gebeur dat Barberspan grotendeels of totaal opdroog.

In die diep sentrale deel van die pan het ons tot dusver dieptes van byna 6 m. gemeet en vermoedelik sal die grootste dieptes van dié pan nie 10 tot 12 m. oorskry nie. Die uitgestrekte wye lagunes en vlakwaters naby die oewers is in Barberspan baie veranderlik; 'n geringe daling van die water kan groot gedeeltes in vlak moerasse omskep of drooglê Barberspan het gevolglik geen permanente oewerlyn nie. Die veranderlikheid van die watervlak veroorsaak 'n menigte vlak lagunes en waterpoele wat dan 'n groot aantrekkingskrag vir ontelbare individue van die verskeie voëlsoorte is. In die lou water van hierdie poele en lagunes wemel dit van klein skaaldiertjies en insek-larwes wat toereikende voedsel aan sekere voëlsoorte bied.

In die diep sentrale deel van die pan is die water—veral in die winter—taamlik skoon; die wit skyf van die Secchi-instrument is dikwels tot 1 m. nog sigbaar. Hier skep die rykdom aan visse en waterplante 'n uitstekende terrein vir talle soorte swemvoëls.

THE BIRD SANCTUARY AND RESEARCH STATION, BARBERSPAN

Dr. T. Farkas

THE station at Barberspan is one of the smallest and most recent of the sanctuaries and research stations of the Nature Conservation Section of the Transvaal. The sanctuary was established on an area comprising approximately 800 acres in the year 1951 for the purpose of protecting and studying the remarkable bird life here. It was no mere coincidence that the choice fell on this remote place as Barberspan was always famous for its abundance of birds. The fame of Barberspan has

Aerial photo of Barberspan and Leeupan.

Lugfoto van Barberspan en Leeupan.

Barberspan lê naby die westelike rand van die hoëveld; in ooreenstemming met hierdie posisie is sy hele omgewing—afgesien van enkele bloekomplantasies—'n oop graslandskap waar die jaarlikse reënval normaalweg om 300 mm. varieer. Verder weg van die pan kom uitlopers van die nabygeleë Kalahari-doringveld in die vorm van klein kolle bos voor. Hierin tref mens westelike voëlsoorte soos bv. die familievoëls (*Philetairus socius*) aan wat hulle reusagtige neskolonies op die kameeldoring (*Acacia giraffae*) bou.

Neste van familievoëls in 'n kameeldoring.
Nests of the sociable weaver in a camelthorn tree.

Tot dusver is daar op Barberspan 188 voëlsoorte waargeneem. Hiervan is daar slegs 98 soorte wat ook op die reservaat broei. Verder kan 'n groot aantal van al dié soorte net af en toe hier waargeneem word. 'n Ander gedeelte is dan weer slegs op besoek as gaste by ons, wanneer hulle vanuit die verre Europa en Asië hier vir die somer vertoef. Hulle kan van Oktober af tot April op die pan gesien word. Die rede vir die geringe aantal wat hier broei, is die oop karakter van die pan. Die soutgehalte van die pan se water en die meestal kalkerige grond is vir 'n hoër plantegroei ongunstig en dus is daar 'n gebrek aan die vernaamste voorwaardes wat baie soorte voëls vir hul broeibedrywighede stel. Hier kan nog bygevoeg word dat, hoewel die brakheid (en nog ander faktore) sekere nadele vir die voëllewe meebring, hierdie posisie tog 'n groot voordeel vir die mense inhou, deurdat daardie soorte waterslakke wat as tussengasheer vir die Bilharzia-parasiet dien, nie hier voorkom nie.

considerably increased since the establishment of this sanctuary and often attracted specialists from Europe and America who were eager to extend their knowledge of South African bird life here. It might therefore also be worth our while to become better acquainted with this unique bit of the South African scene and to be briefly informed as to the work and objects of this station.

Barberspan and Leeupan, separated from one another by a low ridge only, lie in the central bend of a tectonic fissure running more or less from north-west to south-east and containing a series of similar shallow pans. But the greatest difference between all those pans and Barberspan is that Barberspan is the only permanent water. Leeupan, not exceeding 3 m. in depth at normal water level, may dry up altogether in case of continued drought (this was the case from November 1959 to March 1961), but in rainy years a direct connection between the two pans is formed. Barberspan is fed in two ways, firstly, through the periodic Hartz River which runs into the pan through a tributary during the rainy season. Secondly, the pan is probably also fed by fountains on the pan bed. Only very seldom, after years of continued drought, Barberspan may almost, if not entirely, dry up.

In the deep central portion of the pan we have hitherto measured depths of approximately 6 m. and presumably the greatest depths of this pan will not exceed 10-12 m. The extensive wide lagoons and shallows near the shores are very variable; a slight drop in the water level may convert large portions into shallow marshes or may drain them. Consequently Barberspan has no permanent shore-line. The variability of the water surface gives rise to a number of shallow lagoons and pools which are a great attraction to large numbers of the various bird species. The lukewarm water of these pools and lagoons abound in small crustaceans and insect larvae which serve as an adequate food supply for certain bird species.

In the deep central portion of the pan the water—especially in winter—is fairly clean; the white Secchi disc is often still visible up to 1 m. below the surface. Here the abundance of fish and waterplants provides an excellent hunting ground for numerous species of swimming birds.

Barberspan lies near the western edge of the high veld; in keeping with this position its entire environment—apart from a few Blue-gum plantations—comprises an open grass landscape where the annual rainfall normally varies around 300 millimeters. Further away from the pan offshoots from the neigbouring Kalahari thorn-bush country form small patches of bush in which one finds western species of birds such as, e.g. the Sociable Weaver (*Philetairus socius*), which build their gigantic communal nests in the Camel-thorn (*Acacia giraffae*).

Up to the present 188 species of birds have been observed at Barberspan. Of these only 98 species are known to breed in the sanctuary. Further a great number of these species can be observed here only now and then. Another group are guests from the distant lands of Europe and Asia which spend the summer here. They may be seen on the pan from October to April. The main reason for the small number of birds which breed here is the open nature of the pan. The salinity of the water in the pan and the predominantly calcareous ground do not favour a higher vegetation and thus for many species of birds the conditions essential to breeding are lacking. It may be added here that although the

In die voëllewe van die pan speel die jaargetye wat hier uit die matige, droë winter en die partykeer baie warm somerreëntyd bestaan, 'n belangrike rol. Daar is 'n aansienlike deur die jaargetye bepaalde wisseling in die getal sowel van die individu as van die soorte. Die meeste voëls kan hier van die einde van Julie tot die einde van November gesien word. Die rede hiervoor lê in die reeds genoemde feit dat vir die meeste soorte voëls, Barberspan geen broeiplek bied nie. Aan die begin van die reëntyd neem die getalle van hierdie soorte aansienlik af. Hulle trek na hul broeiplekke en slegs die jonges, onvolwassenes of dié wat as „ weduwees " in die betrokke jaar nie aan die broeiery deelneem nie, bly agter. Dit is veral die geval met groter watervoëls en roofvoëls waarvan baie nie elke jaar broei nie.

Onder die besoekers is die flaminke die opvallendste en mooiste. Beide soorte, die klein en die groot flamink (*Phoeniconaias minor* en *Phoenicopterus ruber*) kom hier gereeld voor. Na afloop van hul broeityd kom die eerste troppe van hulle reeds teen die einde van April vanuit hul Suid-Afrikaanse broeigebiede by ons aan. Gedurende die winter groei hul aantal dan geleidelik hier op Barberspan aan en die meeste—tot 'n duisend per dag—kan vanaf die middel van Oktober tot die begin of die middel van Desember gesien word. Na afloop van hierdie tydperk kan in die somer maar net kleiner troppe op die pan gesien word en hierdie troppe bestaan soos reeds aangedui, uit „ oujongkêrels " of onrype jong voëls. Net soos die flaminke gedra baie eend- en ganssoorte hulle, dit wil sê met die begin van hul broeityd verdwyn hulle byna en daag weer op wanneer hul kleintjies reeds volgroeid is. Hierdie gedrag is veral tipies van die wildemakou (*Plectropterus gambensis*) wat Barberspan gedurende die winter in derduisende besoek. 'n Ander mooigekleurde gans is die bergeend (*Tadorna cana*). Sy naam is misleidend omdat hy nie 'n eend is nie, maar wel 'n gans. Hy broei taamlik ver van die water af, dikwels in die verlate gate van die erdvark (*Orycteropus afer*). Sy broeityd val in die wintermaande en dus is hy eers diep in die somer op die pan volop. Die verskillende broeiperiodes van die talle eend- en ganssoorte veroorsaak dat baie van hulle te eniger tyd op die pan te sien is. Ten slotte kan hier nog net die algemeenste van hulle aangedui word; die geelbek-eend (*Anas undulata*), die rooibekeend (*Anas erythrorhyncha*), die bruin-eend (*Netta erythropthalma*) en die kolgans (*Alopochen egyptiacus*) asook die bergeend (*Tadorna cana*) wat altyd in massas die toneel op dié pan beheers.

Die algemeenste van al die voëls op die pan is ongetwyfeld die bleshoender (*Fulica cristata*), wat permanent hier bly. Hy broei gedurende feitlik alle jaargetye en maak sy drywende nes uit watergras. Dat hierdie voël nie al te veel op die pan kan vermeerder nie, is net daaraan toe te skryf dat hulle die vernaamste prooi is vir alle roofvoëls wat op die pan voorkom. Die groot babers (*Clarias gariepinus*) stel ook baie belang in jong bleshoenders.

Die tot dusver genoemde eende, ganse, flaminke en bleshoenders is hoofsaaklik plantvreters wat hul kos uit die waterplante en plankton verkry en sodoende 'n belangrike rol in die behoud van die biologiese ewewig van die pan speel. Hulle verhinder ook 'n onwenslike vermeerdering van die plantegroei in die water. In hierdie geval kan kortliks

alkalinity (and other factors too) is attended with certain drawbacks to bird life, this position is of great benefit to man, in that those species of water snails which serve as intermediate hosts to the Bilharzia parasite, are not found here.

The seasons, which here consist of the mild, dry winter and the sometimes very warm summer rainy season, play an important part in the bird life of the pan. There is a considerable fluctuation in the number of both individuals and species in accordance with the seasons. The largest numbers of birds are to be seen here from the end of July to the end of November. The reason for this is that Barberspan offers no breeding places for most species of birds. At the onset of the rainy season there is a considerable decline in the numbers of these species. They migrate to their breeding places and only the young and immature birds or those " widows " not participating in the breeding in that year remain behind. This is particularly the case with larger water-birds and birds of prey, many of which do no breed every year.

Among the visitors the Flamingo is the most striking and the most beautiful. Both species, the lesser and the greater flamingo (*Phoeniconaias minor* and *Phoenicopterus ruber*) are found here regularly. After their breeding season the first flocks of these birds arrive here from their South African breeding areas towards the end of April. During the winter their numbers at Barberspan then gradually increase and the largest flocks—up to a thousand per day—may be seen from the middle of October to the beginning or the middle of December. After this period only smaller flocks can be seen on the pan during the summer and these consist, as already indicated, of " bachelors " or immature birds. The behaviour of many duck and goose species is similar to that of the flamingo as they practically disappear at the commencement of their breeding season and reappear when their young are already full-grown. This behaviour is typical of the Spurwing Geese (*Plectropterus gambensis*) in particular, thousands of which visit Barberspan during the winter. Another beautifully coloured goose is the African Shelduck (*Tadorna cana*). Its name is misleading as it is not a duck, but a goose which breeds at quite a distance from the water, often in the abandoned holes of the Ant-bear (*Orycteropus afer*). Its breeding season falls in the winter months and thus they are not plentiful on the pan until late in the summer. Owing to the various breeding periods of the numerous duck and goose species, many of them are to be seen on the pan at any time. Finally only the commonest of these might just be mentioned here: the Yellow-bill Duck (*Anas undulata*), the Red-bill Duck (*Anas erythrorhyncha*), the Brown Duck (*Netta erythropthalma*) and the Egyptian Goose (*Alopochen egyptiacus*) and also the African Shelduck (*Tadorna cana*) which always dominate the scene on the pan in masses.

The commonest bird on the pan is undoubtedly the African Coot (*Fulica cristata*) which remains here permanently, breeding during practically all seasons and making its floating nest out of watergrass. The inability of this bird to increase on the pan to any great extent is merely attributable to the fact that they constitute the chief prey of all birds of prey which are found on the pan. The large Barbels (*Clarias gariepinus*) are also keen on the young African Coot.

The ducks, geese, flamingoes and African Coot are mainly herbivorous and obtain their food from the water-plants and plankton, thus playing an important part in the maintenance of the biological equilibrium of the pan.

die besware van party hengelaars bespreek word wat meen dat die plantegroei in die pan in die laaste paar jaar geweldig toegeneem het en vir die hengelaars baie moeilikhede veroorsaak het. Die regte antwoord op hierdie besware is dat dit nie hier gaan oor 'n werklike vermeerdering van die plantegroei nie, maar oor die feit dat as gevolg van die laaste twee droogtejare die waterpeil aansienlik gedaal het, wat dan 'n geleidelike vermindering van die wateroppervlakte in die hand gewerk het. In sulke gevalle vergaan net 'n gedeelte van die drywende plantegroei op die drooggeworde pangrond, die meeste dryf egter na die dieper gedeelte. Sodoende word plante en diere op 'n veel kleiner gebied saamgedring. Indien hierdie toestande oor 'n langer tydperk sou voortduur, sou dit weens omstandighede waarop hier nie nader ingegaan kan word nie, eerder 'n massa-afsterwe van die plante as 'n gevaarlike vermeerdering van hul beteken. Bogenoemde toestande is in Barberspan maar net tydelik en die water sal na die eerste goeie reëntyd weer op sy normale hoogte kom en daarmee word dan ook die normale verspreiding van die plantegroei in die pan herstel.

Van die roofvoëls wat Barberspan besoek, is die visarend (*Haliaëtus vocivер*) ongetwyfeld die indrukwekkendste soort. Hierdie arende kan meestal op die dwarsbalk van 'n drywende nesmaakplek opgemerk word waar hulle uitrus of na hul prooi uitkyk. Die wit koppe van die voëls is 'n goeie kenteken en hulle is ook nie baie sku nie; mens kan taamlik naby hulle kom en na hulle bedrywighede kyk. Die visarende vang nie net visse nie, maar by geleentheid ook voëls, veral die bleshoender. Die manier waarop hulle bleshoenders vang, is baie interessant. Hulle voer 'n tydlank net skynaanvalle op daardie voëls uit. As die bleshoender dan lank genoeg gejaag en moeg gemaak is en nie meer vinnig genoeg kan duik nie, dan slaan die arend eers ernstig toe en gryp met groot sekerheid sy prooi uit die trop weg. Die visarend broei nie by die pan nie, maar kan byna dwarsdeur die jaar gesien word. 'n Ander soort roofvoël, die paddavreter (*Circus ranivorus*) is net gedurende die winter hier volop. Hulle eet nie net paddas, akkedisse of groot sprinkane nie, maar vang ook klein voëls en gaan veral die rooibekvink (*Quelea quelea*) en kaffervinke (*Euplectes orix*) te lyf, wat hier veral in die herfs in groot troppe rondvlieg. Baie selde (sedert 1958 net twee keer waargeneem) lê aasvoëls (*Gyps coprotheres*) by Barberspan 'n besoek af. Die sekretarisvoëls (*Sagittarius serpentarius*) wat ook tot die familie van die aasvoëls behoort, kan mens nogal dikwels hier sien. Ongetwyfeld maak enkele pare sekretarisvoëls in die nabye omgewing hul nes, aangesien ek reeds herhaaldelik gesien het hoe hulle met nesmateriaal in die bek oor die reservaat vlieg.

In die ekologiese lewe van dié pan vervul die visetende voëls 'n belangrike rol. In natuurlike varswaters waarvan die natuurlike toestand ongeskonde gelaat is soos dit ook met Barberspan die geval is, gaan 'n rykdom aan visse met 'n rykdom aan visetende voëls gepaard. Hierdie voëls sorg van hul kant daarvoor dat die visbevolking altyd op 'n normale peil gehou word. Indien daar by die visbevolking om watter rede ook al 'n massa-afsterwe sou intree of die aantal visse sê deur 'n onwenslike vermeerdering van die voëlfaktor verminder sou word, sal die oorgrote meerderheid van die voëls, of miskien almal, spoedig die terrein verlaat. Hierdie verskynsel berus veral op 'n fisiologiese feit, want dit is bekend dat die energie-omset van voëls baie vinnig is en dus kan hulle 'n toestand

They also prevent an undesirable increase in the vegetation in the water. In this connection the objections of some anglers, who think that the colossal increase in the pan vegetation in the last few years has given rise to many angling difficulties, might be discussed briefly. In reply to these objections it may be stated that the real point at issue is not so much an actual increase in the vegetation, as the fact that the water level fell considerably as a result of the last two years of drought, and caused a gradual decrease in the water surface. In such cases only a portion of the floating vegetation perishes on the dried up pan shores, the major portion being carried away to the deeper part. Thus plants and animals are crowded together in a much smaller area. Should these conditions continue over a longer period, this would mean a mass extinction of the plants rather than a dangerous increase in their number, owing to circumstances which cannot be detailed here. The abovementioned conditions are only temporary in Barberspan, the water regaining its normal level after the first good rainy season and restoring the normal distribution of the vegetation in the pan.

Of the birds of prey visiting Barberspan the Fish Eagle (*Haliaëtus vocìver*) is undoubtedly the most impressive species. These eagles are mostly seen on the crossbar of a floating roost where they rest or look out for their prey. These birds are readily distinguished by their white heads and they are not very shy either; one is able to come pretty near them and watch their activities. The Fish Eagle catches fish, but occasionally birds as well, especially the African Coot. The manner in which they catch the African Coot is most interesting. They feign attacks on those birds for some time and only when the African Coot has been chased sufficiently and is too exhausted to dive quickly enough the eagle attacks in earnest and grabs its prey from the flock with great certainty. The Fish Eagle does not breed at the pan, but may be seen practically throughout the year. Another species of bird of prey, the African Marsh Harrier (*Circus ranivorus*) abounds here in the winter only. Not only do they eat frogs, lizards or large grasshoppers, but they also catch small birds and are particularly fond of attacking the Red-billed Quelea (*Quelea quelea*) and the Red Bishop Bird (*Euplectes orix*) which fly about here in great numbers, especially during the autumn. Very seldom (since 1958 observed twice only) Vultures (*Gyps coprotheres*) pay a visit to Barberspan. The Secretary Birds (*Sagittarius serpentarius*) which also belong to the vulture family, are quite often seen here. Undoubtedly a few pairs of Secretary Birds make their nests in the vicinity, as I have repeatedly noticed them flying over the sanctuary with nest material in their beaks.

In the ecological life of this pan the piscivorous birds play an important part. In natural fresh waters not yet touched by man and the natural condition of which has been left intact as in the case of Barberspan, an abundance of fishes go hand in hand with an abundance of piscivorous birds. These birds see to it that the fish population is always maintained at a normal level. Should there be a mass mortality among the fish population for any reason whatever or a decrease in the number of fish owing to an undesirable increase in the bird factor, the vast majority of the birds, if not all, would very soon leave the site. This phenomenon is based mainly on a physiological fact, for it is common knowledge that the metabolism of birds is very rapid so that they cannot endure a condition of malnutrition for longer than a few days. Thus they must soon look out for a new hunting ground where they will not have to struggle so hard to get hold of a few lean fish, or in other words, the law of the line

van ondervoeding nie langer as 'n paar dae verduur nie. Dus moet hulle spoedig na 'n nuwe jagterrein uitkyk waar hulle nie so baie moet sukkel om 'n paar maer vissies te kan bekom nie. Of met ander woorde, by hulle is ook die natuurwet van die maklikste weg van toepassing, wat beteken dat hulle nastreef om met die kleinste kraginspanning die grootste sukses te behaal. In hierdie lig beskou, hoef niemand bevrees te wees dat duikers, pelikane of ander visetende voëls ooit 'n natuurlike water kan leegvreet nie. So iets is tot dusver ongekend en juis ooreenkomstig bogenoemde natuurwette reeds uit die staanspoor uitgesluit. In Barberspan is die biologiese ewewig tot dusver gesond en hiervan getuig veral die groot aantal visetende voëls op die pan. Die algemeenste van al hierdie voëls is die witbors-duiker (*Phalacrocorax carbo*) wat met sowat 80 pare tot die permanente voëlfauna van die pan behoort. Hulle broei veral in die laat winter hier, maar broeipare kan die hele jaar aangetref word. As broeiplekke kies hulle liefs die deur die wind saamgedrewe massas watergras waarop die nes-kolonies dan opgerig word. 'n Interessante verwant van die duikers is die anhinga of slanghalsvoël (*Anhinga rufa*) wat wel nie in Barberspan broei nie; daar kan egter dwarsdeur die jaar 'n paar van hulle hier gesien word. Die swemwyse is eienaardig; die liggaam is heeltemal onder die water, slegs die lang nek steek uit net soos 'n swemmende slang.

Die twee soorte pelikane (*Pelecanus onocrotalus* en *P. rufescens*) wat hier voorkom, beweeg meestal in klein groepies van 4 -6 individue in die vlak lagunes waar hulle die visse met hul rekbare kaak-sak uitskep en met 'n reeks van nekbewegings afsluk. Hulle is maar taamlik versigtig en as iemand hulle wil bykom, vlieg hulle met 'n paar kragtige slae van die magtige vleuels hoog in die lug, waar hulle dan net soos planeerbote rondsweef. Een of twee pare van die reuse-reiers (*Ardea goliath*) broei ook gereeld op die reservaat saam met 2 of 3 pare van die swartkop-reiers (*Ardea melanocephala*). Die reuse-reier maak sy nes meestal op die drywende gras op die pan, maar die swartkop-reiers het tot dusver een van die seldsame bome wat in die oop veld staan gekies. Ook ander reiersoorte is op Barberspan volop. Onder hulle kan nog die pragtige klein swartreier (*Melanophoyx ardesiaca*) vanweë sy eienaardige gewoontes genoem word. Hy gaan dikwels onder 'n „ skerm " kos soek: die voël rek na elke tweede of derde stap skielik sy nek horisontaal uit terwyl die vlerke terselfdertyd net soos 'n sambreel oor die kop uitgebrei word. Dit skakel die weerspieëling van die wateroppervlakte onder die skerm uit en die voël kan klein diertjies wat voor hom in die water swem, baie beter sien. Hierdie deftige voël met blouswart vere en swawelgeel pote kom net in die wintermaande by ons voor, wanneer hier gewoonlik een of twee op die reservaat gesien kan word.

Visvangers besoek Barberspan baie selde. Die rede hiervoor is dat die oop geaardheid en skamele oewerplantegroei of rotse te min sitgeleentheid vir hierdie voëls aanbied, waar hulle op hul manier kan sit en na hul prooi uitkyk. Die meeste van hulle kan in die winter hier op die omheiningsdrade van die reservaat waar dit oor die water loop. gesien word. Dit is by uitstek die kuifkopvisvanger (*Corythornis cristata*) wat

of least resistance is also applicable to them, which means that they strive to achieve the greatest success with the least possible exertion. Viewed in this light, nobody need fear that cormorants, pelicans or other piscivorous birds will ever be able to exhaust the food supply of a natural water. In Barberspan the biological equilibrium has thus far been sound and this is borne out particularly by the large number of piscivorous birds on the pan. The commonest of all these birds is the White-breasted Cormorant (*Phalacrocorax carbo*) of which some 80 pairs belong to the permanent bird fauna of the pan. They breed here especially in the late winter, but breeding pairs are to be found here all the year round. As breeding places they choose masses of watergrass driven together by the wind. An interesting relative of the cormorant is the Anhinga or Darter (*Anhinga rufa*) which does not, however, breed in Barberspan but a few of which are seen here throughout the year. They swim in a peculiar manner, the whole body being submerged, only the long neck protruding just like a swimming snake.

The two species of Pelicans (*Pelecanus onocrotalus*) and (*P. rufescens*) which may be found here, generally move in small groups of 4-6 individuals in the shallow lagoons where they scoop up the fish into their elastic jaw-pouches and swallow them down with a series of neck movements. They are inclined to be rather cautious and, if anyone tries to come near them, they fly high up into the air with a few powerful strokes of their mighty wings and glide about like hydroplanes. One or two pairs of the Giant Heron (*Ardea goliath*) together with two to three pairs of the Black-headed Heron (*Ardea melanocephala*) are also regular breeders in the sanctuary. The giant heron usually makes its nest on the floating grass

The goliath heron at its nest.
Die reusereier by sy nes.

met sy pragtige glansende kleure 'n ware juweel onder die voëls van Barberspan is. 'n Ander voel wat tot die familie van die waadvoëls behoort, is die rooipoot-elsie (*Himantopus meridionalis*); hy kan af en toe op die oewers gesien word en broei ook somtyds hier by ons. Die oewers van die pan wemel altyd van verskeie klein waadvoëls soos kiewiete en strandlopertjies. Vanaf Oktober tot April word hul aantal deur 'n groot aantal Eurasiese verwante nog verder aangevul. Dit is 'n eienaardige gevoel om na die talle somergaste aan die oewers te kyk, wat almal derduisende myle oor die hele aardbol getrek het om hier in Suid-Afrika te beland en die somer hier te vertoef. Daar is onder hulle byvoorbeeld die krombek-strandlopers (*Calidris testacea*) wat uit hul broeigebied in Noordelike Asië dwarsdeur Europa en die hele Afrika getrek het, of die interessante kemphane (*Philomachus pugnax*) wat in die somer nog in hul onaansienlike winterklere hier by ons aankom (want in hul broeigebiede op die noordelike halfrond is dit dan winter). Maar sodra hulle ons in die herfs verlaat, trek die hanetjies hul pragklere met die afsonderlike kragie aan om daarmee in die milde noordelike lente voor hul wyfies te kan pronk. Dit speel by hierdie soort voël wat in poligamie lewe 'n belangrike rol en die hanetjies streef om so veel wyfies as moontlik na mekaar te kan verower.

Die laboratorium.
The laboratory.

on the pan, but the black-headed heron has so far chosen one of the rare trees standing in the open veld. Barberspan abounds in other species of heron as well. Among these the lovely small Black Heron (*Melanophoyx ardesiaca*) may be mentioned because of its peculiar habits. It often seeks its food under a " shade ", which means that this bird suddenly stretches its neck out horizontally after every second or third step and the wings are at the same time spread over its head just like a sunshade. This eliminates the reflection of the water surface under the shade and the bird is able to devote its undivided attention to the various animals swimming about in the water. This fine bird with blue-black feathers and sulphur yellow legs is found with us in the winter months only, when one or two may be seen every week.

Kingfishers very seldom visit Barberspan for the reason that its open nature and scant marginal vegetation or lack of rocks offers too few places for these birds to perch and watch for their prey. Most of them can be seen here in the winter on the wire fence where it crosses the water. The Malachite Kingfisher (*Corythornis cristata*) with its fine bright colours is a real jewel among the birds of Barberspan. Another bird belonging to the family of waders is the Black-winged Stilt (*Himantopus meridionalis*) which may be seen on the shores now and then and also breeds here sometimes. The shores of the pan always teem with various small waders such as Lapwings, and Sand Plovers. From October to April their number is supplemented still further by a large number of Eurasian relatives. It is a peculiar sensation watching the numbers of summer guests on the banks, which have all migrated thousands of miles all over the globe to spend the summer here in South Africa. Among them are, for example, the Curlew Sandpiper (*Calidris testacea*) which have migrated from their breeding area in Northern Asia right through Europe and the whole of Africa, or the interesting Ruff (*Philomachus pugnax*) which come to us in the summer, still in their insignificant winter garb (for in their breeding areas in the northern hemisphere it is then winter). But as soon as they leave us in the autumn, the cocks don their gorgeous plumes with the separate little collar in order to strut before their wives in the mild northern spring. This plays an important part in this bird's life while they live in polygamy and the little cocks strive to capture as many wives as possible in succession.

In order to observe the regularities of the migration of various species of birds, observations based on various methods have been organised and carried out on a world-wide basis for more than half a century. Our new research station Barberspan, also participates in this international work, particularly in connection with bird ringing and the collection of data on the arrival and departure of migratory birds. Not only are exotic birds ringed, but also indigenous species which are generally regarded as permanent. Among them there are numerous species which migrate from the high veld to the coastal regions or to Central Africa in the winter, but there are also many which live here permanently. They may also on occasions undertake shorter or longer flights up to a few hundred miles, like the African Coot for example often does. Bird ringing constitutes only a part of our activities.

This station only came into being a few years after the establishment of the sanctuary. In order to satisfy the requirements of research, the station recently acquired a new laboratory. A small power station now supplies the laboratory as well as the private dwelling houses with electricity. On the station site the planting of trees and shrubs was begun since

Om die reëlmatighede van die trek van verskeie voëlsoorte waar te neem, word die betrokke waarneminge, wat op verskeie metodes gegrond is sedert meer as 'n halfeeu dwarsdeur die wêreld georganiseer en uitgevoer. Ons nuwe navorsingstasie Barberspan, neem ook deel aan hierdie internasionale arbeid, veral in verband met voëlberinging en versameling van opgawes oor die aankoms en vertrek van trekvoëls. Nie net uitheemse trekvoëls word bering nie, maar ook inheemse soorte wat algemeen as permanent beskou word. Daaronder is talle soorte wat in die winter van die hoëveld na die kusstreke of na Sentraal-Afrika trek, maar daar is ook baie wat dwarsdeur die jaar permanent hier woon. Hulle kan ook by geleentheid korter of langer reise tot 'n paar honderd myl onderneem, soos bleshoenders byvoorbeeld dikwels doen. Voëlberinging vorm maar net 'n gedeelte van ons werksaamhede. Dié stasie het eers 'n paar jaar na die stigting van die reservaat ontstaan. Om aan die vereistes van navorsing te kan voldoen, het die stasie toe onlangs 'n nuwe laboratoriumgebou gekry, waar die noodsaaklike geriewe vir sodanige arbeid verskaf word. 'n Klein kragstasie voorsien vandag die laboratoriumgebou asook die privaatwoonhuise van elektrisiteit. Op die stasie se terrein is die aanplanting van bome en struike sedert 1959 aangepak wat nie net as estetiese geriewe bedoel is nie, maar veral daarop gemik is om later ook verskeie bosvoëls te kan aanlok om hulle daar te vestig. Gedurende hierdie tydperk is daar meer as 500 bome en struike wat tot meer as 50 in- en uitheemse soorte behoort met sukses aangeplant. Aangesien die droogte reeds twee jaar aangehou het, kan hierdie plantasie net deur natleiding aan die lewe gehou word.

Om ten slotte nog iets oor die toekoms en doelstellinge van die stasie te sê, wil ek hier graag meld dat 'n omvattende publikasie wat sowel aan die deskundiges as aan die belangstellende publiek uitgebreide inligting oor die voëls en hul lewensgewoontes in Barberspan sal verskaf, reeds in die voorbereidingstadium is. Moontlik sal hierdie arbeid in 1962 voltooi wees en sal dan hopelik nie net die tot dusver gedane arbeid afsluit nie, maar ook die verskillende aspekte van die toekomstige werk te Barberspan uiteensit.

1959 not only for aesthetic purposes, but especially to attract various bush birds to settle there. During this period more than 500 trees and shrubs, belonging to more than 50 indigenous and exotic species, were planted successfully. As the drought has continued for two years already, this plantation can be kept alive only by irrigation.

To say a final word about the future and objects of the station, I wish to mention here that a comprehensive publication which will provide extensive information on the birds and their habits in Barberspan to the specialists as well as to the interested public is already in preparation. This work will not only conclude the labour thus far accomplished, but also set out the various aspects of the future work at Barberspan.

DIE EERSTE INVOER EN PRODUKSIE VAN AISCHGRUND KARP IN SUID-AFRIKA

Dr. G. L. Lombard

Laeveldse Visserynavorsingstasie, Marble Hall

IN ons poging om visboerdery as 'n addisionele bron van protiëne te ontwikkel, het ons voor die probleem te staan gekom van die koue Transvaalse Hoëveld wat nie vir kurperboerdery geskik is nie, maar wat oor onontginde natuurlike hulpbronne in die vorm van bruikbare water beskik. Weens die afwesigheid van 'n geskikte inheemse vissoort, moes ons soek na 'n uitheemse species wat aan die nodige vereistes sou voldoen.

In Europa en veral in Duitsland vorm visboerdery reeds vir eeue 'n integrale deel van die landbou-ekonomie. Sedert sy invoer in Duitsland uit die Donou-vallei omtrent 'n duisend jaar gelede word die karp, *Cyprinus carpio,* beskou as 'n baie geskikte vis vir dié doel.

In die kloosters het die monnike omtrent vierhonderd jaar gelede reeds die karpteelt tot 'n gespesialiseerde bedryf ontwikkel. Deur hulle noukeurige seleksie van broeivis het hulle geleidelik nuwe variëteite ontwikkel uit die oorspronklike volskubkarp wat ingevoer was. Die belangrikste van hierdie rasse was vis met minder skubbe en groter liggaamsdiepte wat veroorsaak was deur 'n oorerflike verkorting van die werwelkolom. Hierdie vis was 'n tipe spieëlkarp, wat so genoem word vanweë die paar groot spieëlagtige skubbe aan die sye. Hierdie variëteit het ontstaan in die Aischgrund distrik van Beiere en die Aischgrund karp het geleidelik tot 'n erkende ras ontwikkel.

Teen die begin van die twintigste eeu het daar ook in Galizië 'n baie vinniggroeiende ras ontwikkel. Deur kruising van hierdie ras met die Aischgrund karp, gepaard met streng selektiewe teelt oor dekades onder die bekwame toesig van Professor Wilhelm Wunder van die Universiteit van Erlangen, het 'n vinniggroeiende ras met 'n hoë skof en uniformiteit van vorm en skubrangskikking ontstaan. Die vis wat bekend staan as die Dinkelsbühl variëteit van die Aischgrund karp is ontwikkel op die landgoed van die Werdin familie naby Dinkelsbühl.

Die spieëlkarp is reeds teen die end van die vorige eeu in Suid-Afrika ingevoer en kom vandag reeds oor groot dele van die land in oop water voor. Die eerste Aischgrund karp van die Dinkelsbühl variëteit is in September 1955 op ons aanbeveling in Suid-Afrika ingevoer deur 'n privaat persoon in Transvaal. Die vis is aanvanklik op die Laeveldse Visserynavorsingstasie naby Marble Hall onder kwarantyn geplaas en die eerste kleinvis is daar uitgebroei. 'n Aantal van hierdie vis is by die instituut gehou vir waarneming, en op grond van hulle voordelige eienskappe is ons eie broeistapel in Oktober 1959 ingevoer vir die ontwikkeling van karpboerdery.

Die ongelooflike vinnige groei van hierdie vis onder die gunstige klimaatstoestande in Noord-Transvaal, het selfs die telers van hierdie ras verbaas. In 'n optimaal-besette dam van 400 vis per akker met bemesting en voeding, het die indiwiduele vis vanaf Oktober tot April gegroei tot gemiddeld 1 lb. 4 onse. Dit het 'n totale produksie beteken van 726 pond per

THE FIRST IMPORTATION AND PRODUCTION OF AISCHGRUND CARP IN SOUTH AFRICA

Dr. G. L. Lombard

Lowveld Fisheries Research Station, Marble Hall

IN Europe and especially in Germany, fish farming has for many centuries formed an integral part of agricultural economy. Since its importation into Germany from the lower Danube about one thousand years ago, the carp, *Cyprinus carpio,* has been regarded a suitable fish for culture as a source of food.

In the monasteries about four hundred years ago, the monks had developed carp culture into a specialized practise. Through their careful selection of the breeding fish, new varieties of carp gradually emerged from the original full-scaled stock. The most important of these strains, were fish with less scales and greater body depth caused by a hereditary shortening of the vertebral column. These fish were a type of mirror carp, so-called because of the few large mirror-like scales on the sides of their bodies. This trend of development took place in the Aischgrund district of Bavaria and the Aischgrund carp gradually established itself as a recognised variety.

By the turn of the century another strain of very fast-growing carp had been developed in Galizia. By crossing this variety with the Aischgrund carp, coupled with careful selective breeding over decades under the professional supervision of Professor Wilhelm Wunder of the University of Erlangen, a fast-growing fish with a high hump and uniformity of shape and scaling was produced. This fish, which is known as the Dinkelsbühl variety of Aischgrund carp, was developed on the estate of the Werdin family near Dinkelsbühl.

The mirror carp was introduced into South Africa by the end of the nineteenth century and today it occurs in open waters over large parts of the country. The first Aischgrund carp of the Dinkelsbühl variety to be introduced into South Africa in September, 1955, were imported privately on our advice. The purpose was to establish fish farming on the cold Highveld which is unsuited to Tilapia. The fish were initially quarantined at the Lowveld Fisheries Research Station near Marble Hall and the first spawning took place at this institute. A number of fish were kept for observation and on the grounds of their favourable characteristics, a breeding stock for the development of carp farming was imported in October, 1959.

The incredible growth of this fish under the favourable climatic conditions of the Northern Transvaal has astounded even the originators of this variety. In an optimally stocked pond of 400 fish per acre, with fertilisation and feeding, the individual fish grew to a weight of 1 lb. 14 ounces from October to April, giving a total production of 726 lb. per acre within $18\frac{1}{2}$ weeks. Ten weeks later, i.e. after altogether 28 weeks, the same fish weighed 2 lb. 9 ounces and the total production was 1,037 lb. per acre.

akker binne 18½ weke. Tien weke later, dit wil sê na altesaam 28 weke het dieselfde vis 2 lb. 9 onse geweeg en was die opbrengs per akker 1,037 pond. In 'n dam met omtrent 'n derde van die aantal vis (d.w.s. 60 vis per akker) het indiwidue 4 lb. 9 onse geweeg en was die opbrengs 332 pond per akker na 18½ weke. Hierdie vis het geen voeding ontvang nie, slegs anorganiese bemesting is toegedien.

Om vas te stel wat die absolute maksimum moontlike groei van hierdie vis is, is net vier vissies saam met Bloukurper-vingerlinge in 'n een-akker-dam geplaas. Na agt maande onder die gunstigste omstandighede, dit wil sê met bemesting maar sonder kunsmatige voeding, het die vis gegroei tot tussen 8 pond en 8 pond 2 onse elk. Die oorspronklike vis wat in 1955 ingevoer is, het in net minder as 5½ jaar 30 pond stuk geweeg.

Mens kan dus as jy met karp boer, deur die besettingsdigtheid te reël, vooraf bepaal watter grootte vis geoes gaan word. Die natuurlike produksie van ons damme is gemiddeld 150 pond vis per akker per jaar. As so 'n dam met vyftig vis beset word, behoort hulle aan die einde van die seisoen 3 lb. elk te weeg. Deur bemesting en voeding kan die besettingstal en totale opbrengs soos uit bostaande produksiesyfers blyk, verhoog word sonder dat afbreuk gedoen word aan die stukgewig van die vis.

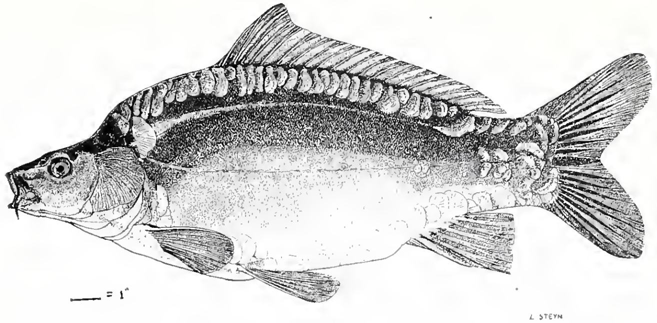
In hierdie fantastiese produksiesyfers tesame met die feit dat een wyfie tussen 400.000 en 500.000 eiers kan lê, skuil die groot gevaar van hierdie vis. Mens sou met die eerste impuls neig om alle ander vissoorte te verontagsaam en te konsentreer slegs op boerdery met Aischgrund karp of om hierdie vissoort sonder voorbehoud in damme of binnelandse waters los te laat.

Soos ons sien, is die Dinkelsbühl variëteit van die Aischgrund karp die resultaat van intensiewe selektiewe teelt en kan dit seker as die hoogsgedomestiseerde Europese vis beskou word. Om sy gesogte kenmerke soos die klein kop, hoë skof, beperkte aantal en rangskikking van sy skubbe en veral sy vinnige groei te behou moet die karpboer streng seleksie toepas in die keuse van sy broeivis. Hulle moet met dieselfde sorg gekies word as wat 'n perdeboer sy teeldiere sou uitsoek om die beste resiesperde te lewer.

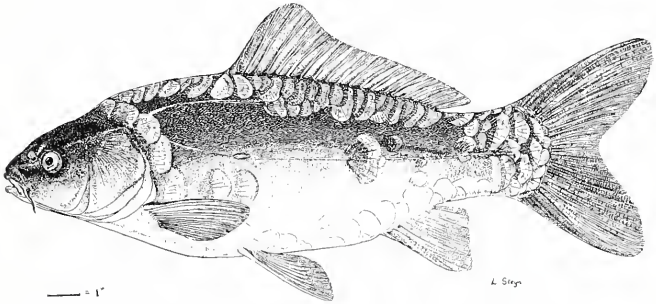
In elke karp broeisel kry ons wat Walter(13) noem " das Auseinanderwachsen " of uitmekaargroei van indiwidue; dit wil sê dat daar behalwe die groter massa gemiddelde vis altyd 'n aantal is wat vinniger en ook 'n aantal wat stadiger groei. Uit die vinniggroeiende vis moet die indiwidue met die beste ander kenmerke gekies word as toekomstige teelvis.

Atavismes of terugslae na voorvaderlike kenmerke, soos byvoorbeeld die herverskyning van skubbe, kom in ons ervaring reeds in die eerste geslag voor en die visboer moet sorg dat hierdie vis nie toegelaat word om te broei nie. Die mate van atavering kan duidelik gesien word in fig. 2 waar vis uit dieselfde broeisel met mekaar vergelyk word.

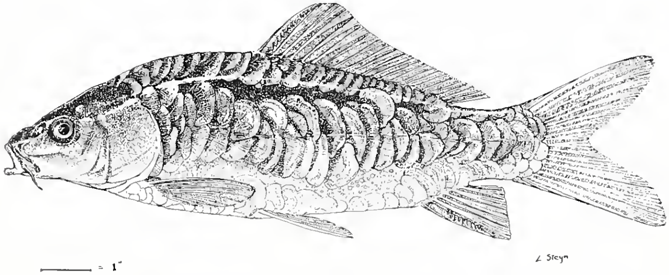
Die gewoonte van karp om op die bodem te vreet kan in hoë bevolkings die water so modderig maak dat dit vir baie van ons inheemse soorte ongunstig word en selfs vir vee-suiping ongeskik raak. Schaeperclaus(12) meld dat die hengel van ander vissoorte in sommige Duitse mere geweldig agteruitgegaan het na die invoer van karp. Hy gaan voort om te sê dat, deurdat karp 'n vis is wat moeilik te vang word, die vis soveel van die natuurlike voedsel verbruik dat daar vir die behoud van ander visse min voedsel oorbly.



The Dinkelsbühl variety of Aischgrund carp.
Die Dinkelsbühl varieteit van die Aischgrund karp.



Mirror carp commonly found in Transvaal waters.
Spieëlkarp wat algemeen in Transvaal voorkom.



A mirror carp which lived under unfavourable conditions.
'n Spieëlkarp wat onder ongunstige toestande gelewe het.

Fig. 1.

In a pond with about a third of this stocking rate (i.e. 60 fish per acre), individuals weighed 4 lb. 9 ounces and the total yield was 332 pounds per acre after 18½ weeks. These fish were not fed, only inorganic fertiliser was applied to the pond.

To establish the absolute maximum possible growth of this fish, four specimens were stocked together with *Tilapia mossambica* fingerlings in a one acre pond. After eight months, under the most suitable conditions,

Dit is ook opvallend dat, veral die Aischgrund karp deur die eeue van „ domestisering " so net-sku geraak het dat dit ontmoontlik is om 'n net te gebruik om 'n dam van hierdie vis te bevry, of om die karp met 'n net te oes. Karp-produksie-damme moet dus altyd so gebou word dat hulle heeltemal leeggemaak kan word om die vis te oes.

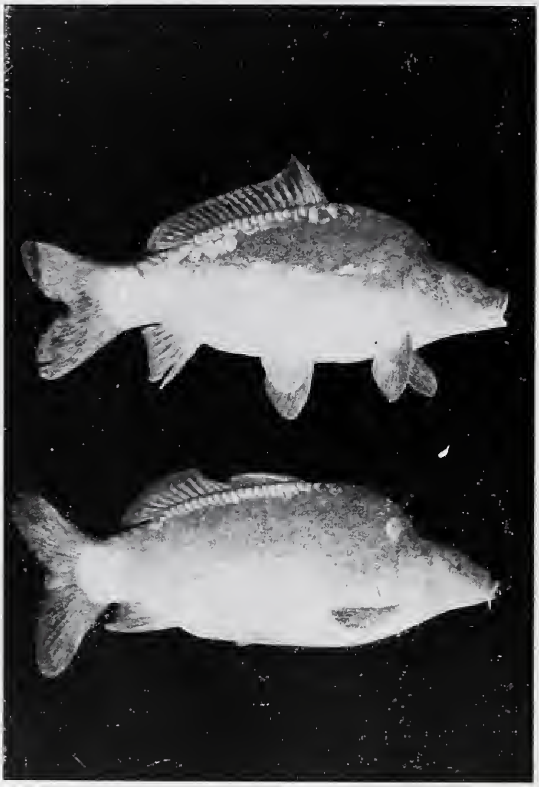


FIG. 2.

Twee visse uit dieselfde broeidam. Die onderste een vertoon die tipiese skub-patroon van die Dinkelsbühl tipe terwyl die boonste vis die skubrangskikking van die voorvaderlike spieëlkarp besit.

Two fishes from the same breeding-pond. The lower one shows the typical Dinkelsbühl scale pattern while the upper one has the scale arrangement of the ancestral mirror carp.

Die enigste ander manier waarop die vis uit 'n dam of natuurlike water verwyder kan word, is deur die toediening van spesiale gifstowwe. Dit beteken natuurlik die vernietiging van die totale visbevolking en vereis herbevolking met gewenste soorte. Honderde duisende dollars is reeds deur die Regering van die Verenigde State van Amerika spandeer om hulle water te bevry van karp wat vroeër onoordeelkundig losgelaat is.

with fertiliser but no artificial feeding these fish had grown to between 8 pounds and 8 pounds 2 ounces each. Of the original fish imported in 1955, individuals had attained a weight of 30 pounds in just under 5½ years.

It is therefore possible in carp farming, to regulate the size of fish to be cropped by varying the stocking rate. The natural production of our ponds averages 150 lb. per acre per year. In stocking such a pond with fifty fish, they should weigh 3 lb. each within a year. By fertilising and feeding the stocking rate and total yield can thus be enlarged without any detrimental effect on the individual growth of the fish.

In these fantastic production figures together with the fact that one female can lay between 400,000 and 500,000 eggs, lies the great danger of this fish. On the first impulse one would tend to disregard all other species and concentrate on farming with Aischgrund carp only or on releasing this fish in dams and inland waters without reserve.

As we have seen the Dinkelsbühl variety of the Aischgrund carp is the outcome of the most intensive selective breeding, and it can be regarded as the most highly domesticated European fish. To retain its desired characteristics such as the relatively small head, high hump, limited number and arrangement of scales and especially its fast growth, the carp farmer should be very strict in the selection of his breeders. They should be chosen with the same care as a horse breeder would choose his studs to produce the best race-horses.

In every carp spawning one finds what Walter (13) calls " das Auseinanderwachsen " or divergent growth of individuals. In other words there are always, apart from the majority of average fish, a number of individuals which grow faster and a number which grow slower. The breeders should be selected from the faster growing fish with the desired characteristics.

Atavisms or the recurrence of ancestral characteristics, like for instance the recurrence of scales, already occur in the first generation and the fish farmer should not allow such fish to spawn. The degree of atavation can clearly be seen in fig. 2 where fish of the same spawning are compared with each other.

The bottom-feeding habit of carp can, in high populations, render the water so muddy that it becomes unfavourable for many indigenous species of fish and unsuitable for the purpose of watering stock. Schaeperclaus(12) mentions that the angling of other species of fish in some German lakes deteriorated considerably after the introduction of carp into these waters. He further states that on account of its being a difficult fish to catch the carp utilize so much of the natural food that little is left for the sustenance of other fish.

It is remarkable too, that especially the Aischgrund carp, has through the centuries of its " domestication " become net-shy to such a degree that it is impossible to use a net in order to crop a pond of these fish. Any ponds in which carp are to be produced, should therefore be constructed in such a way that they can be emptied completely to crop the fish.

The only other way in which these fish can be removed from uncontrollable impoundments or natural waters, is through the use of special selective fish poisons. This means the destruction of the entire fish population and restocking with desirable species. It has already cost the Government of the United States of America hundreds of thousands of dollars to rid their waters of carp which had formerly been indiscriminately introduced.

Vir hierdie baie ooglopende redes moet die loslating of ontsnapping van Aischgrund karp in ons natuurlike waters ten alle koste voorkom word. Dit is daarom noodsaaklik dat damme wat vir karpboerdery bedoel is, streng volgens voorskrif gebou moet word en dat behoorlike siwwe by beide die in- en uitlate voorrang moet geniet.

Met al hierdie feite voor oë en die toepassing van alle nodige maatreëls en korrekte hantering, belowe die Aischgrund karp egter om 'n belangrike vis te word in die totstandkoming van visboerdery op 'n gesonde grondslag in ons land, tot so 'n mate dat die Afdelings vir Binnelandse Visserye van die Kaapprovinsie en Natal in 1961 deur ons voorsien is van Aischgrund karp vingerlinge om die produksie van hierdie ekonomiese boerdery-vis tot die beste voordeel van hulle provinsies te ontwikkel.

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For these very obvious reasons, the release or escape of Aischgrund carp into our natural waters should be avoided at all cost. It is therefore imperative that ponds intended for carp farming should be built strictly according to prescription and adequate screening at both the inlets and outlets of these ponds should receive every priority.

With all these facts in mind and with the application of all the necessary precautions and correct handling, the Aischgrund carp however promises to become an important fish in the establishment of fish farming on a sound basis in our country; so much so that the Departments of Inland Fisheries of the Cape Province and Natal have in 1961 been supplied by us with carp fingerlings to develop fish-farming to the best advantage in their respective provinces.

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INTERESSANTE VELDWAARNEMINGS

Sebra neem Perdevul aan

Dr. J. G. van der Wath het twee Sebras na sy plaas Welgelegen in Ermelo distrik gebring. In dieselfde kamp waar huule loop, word ook perde aangehou. Eendag is daar opgemerk dat die Sebra-merrie 'n klein perdevulletjie aangeneem het en dat sy die perdemerrie van die vul af weghou. Omdat die sebra natuurlik geen melk gehad het om die vulletjie te voed nie, moes dit gevang word en van die sebra af weggeneem word.

P. W. J. ADENDORFF,
Natuurbewaringsbeampte,
Ermelo.

INTERESTING FIELD OBSERVATIONS

Zebra Adopts a Foal

Dr. J. G. van der Wath brought two zebras to his farm Welgelegen in the district of Ermelo. They were kept in a paddock with some horses. One day it was noticed that the Zebra mare had adopted a small foal and that she was driving the mother away from it.

Because the Zebra had no milk to feed the foal, it had to be caught and removed to another camp with its mother.

P. W. J. ADENDORFF,
Nature Conservation Officer,
Ermelo.

Cross Between Blesbuck and Red Hartebeest

The late minister Collins had a farm named Lion's Glen near the Swaziland Border in Ermelo district. Here he kept various kinds of game, amongst which were blesbuck and red hartebeest.

In the course of time all the hartebeest cows died and only two bulls remained. Eventually the red hartebeest crossed with the blesbuck. The offspring were infertile and exhibited characteristics of both species.

P. W. J. ADENDORFF,
Nature Conservation Officer,
Ermelo.

Cheeky Springbuck

I reared a springbuck ram by hand. It was suckled by a jersey cow. When it was two years old I put a hand-reared springbuck ewe with it. The ram took no notice of her however and stayed with the jersey cows. He declared himself the leader of the jersey cattle and drove the bull out of the paddock. The herd of jerseys tolerated everything from the springbuck, who drove them wherever he wanted and even tried to mate with young heifers.

C. D. AHLERS,
Farmer,
Ermelo District.

Jackal Catches New-born Impala Lamb

One day I was watching an impala ewe from behind a rock while she was giving birth to a lamb. I could hardly believe my eyes when a black-backed jackal suddenly appeared, took the lamb and trotted away with it. When the mother looked round to see her baby, it was gone.

C. D. AHLERS,
Farmer,
Ermelo District.

Kruising tussen blesbok en rooihartbees

Op die Swasilandgrens in Ermelo distrik het Oud-minister Collins 'n plaas, Lions Glen, gehad waar hy allerhande wildsoorte aangehou het. Daar was onder andere ook blesbokke en rooihartbeeste. Die hartbeeskoeie is later almal dood en slegs twee bulle het oorgebly. Met die loop van jare het die rooihartbeeste met die blesbokke gekruis. Die nageslag was onvrugbaar en het duidelike kenmerke van albei wildsoorte besit.

P. W. J. ADENDORFF,
Natuurbewaringsbeampte.
Ermelo.

Astrante springbok

Ek het 'n springbokram hans grootgemaak. Hy het aan 'n jerseykoei gesuip. Op twee jaar ouderdom bring ek 'n springbokooi wat ook hans grootgemaak is by hom. Hy neem egter geen notisie van die springbokmaat nie en bly net by die jerseybeeste. Hy verklaar homself leier van die jerseybeeste, die jerseybul word uit die kamp verdryf en is so bang vir springbok se kind dat hy uit die kamp vlug. Die jerseybeeste verdra alles van die springbokram: hy dryf hulle net waar hy hulle wil hê en probeer selfs om verse te dek.

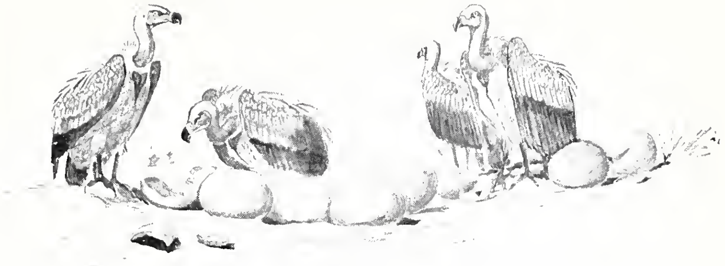
C. D. AHLERS,
Boer,
Ermelo Distrik.

Jakkals vang pasgebore rooiboklam

Ek het eendag in die laeveld 'n rooibokooi wat besig was om te lam van agter 'n klipbank dopgehou. Ek kon my oë nie glo toe 'n rooijakkals die lam daar voor my neus wegvat en daarmee wegdraf nie. Toe die ooi omkyk, was daar niks: sy het nooit haar lam gesien nie.

C. D. AHLERS,
Boer,
Ermelo Distrik.

Vultures Eat Ostrich Eggs



During August 1960 one of my Bantu labourers told me how he watched a flock of vultures eating up eleven ostrich eggs on the Langjan Nature Reserve. They pecked at the eggs until they broke and then devoured the contents. There was no ostrich near the nest.

I visited the nest and found only the broken fragments of egg shells lying around.

J. H. SERFONTEIN,

Nature Conservation Officer,
Zoutpansberg.

Age of South African Seed-eating Birds

In October 1925 I caught a Black-throated Canary on the farm Roodekuil No. 2 in Brits district. The bird was already full-grown.

I kept it in a small cage on my front stoep in Pretoria-West. Although the cage was small the bird was very well cared for and taken indoors at night. It was fed on a balanced ration of yellow manna, green grass from the vicinity and thistle with seeds on. Now and then it also got hard-boiled egg and marie biscuit. The bird was never ill. In 1944 it was very old with growths on its feet known as " boots on " although it still sang very well. In March 1944 it died of old age after 18 years and 5 months in captivity.

In March 1947 I received a Bully Seed-eater from a certain Dr. Flynn of London. It was kept in a cage of ± 20 ft. by 10 ft. by 8 ft.

This bird was entered on many bird shows and on 4 occasions it was declared runner-up to the best South-African wild bird. It was really a lovely bird.

It was fed on peppers, sunflowers, yellow millet, manna, ordinary yellow manna and imported grass seeds.

In February 1961 the bird fell ill and was treated with terramycin powder which was added to its food. It was treated in a small cage $15 \times 12 \times 8$ inches and recovered after 4 days.

Aasvoëls vreet volstruiseiers

Gedurende Augustus 1960 het een van my Bantoe-arbeiders vertel dat hy gesien het hoe 'n klomp aasvoëls elf volstruiseiers in 'n nes stukkend pik en die eiers opvreet. Daar was geen volstruis naby die nes nie. Ek het ondersoek gaan instel en gevind dat al die eiers opgevreet was. Daar het slegs stukke eierdoppe rondgelê.

J. H. SERFONTEIN.
Natuurbewaringsbeampte,
Zoutpansberg.

Ouderdom van S.A. saadetende voëls

In Oktober 1925 het ek 'n Bergkanarie op die plaas Roodekuil No. 2 in Brits distrik gevang.

Die voël was toe reeds volgroei. Ek het die Bergkanarie in 'n klein afslaan-vanghokkie op my voorstoep in Pretoria-Wes aangehou. Hoewel die hokkie klein was, is baie goed vir die voël gesorg en saans was hy in die huis geneem. Die voël was voorsien met gebalanseerde voeding, bestaande uit geel manna, groen grassoorte wat in die omgewing groei, asook sydissels met saad aan. Af en toe het hy ook hardgekookte eier en marie-beskuit gekry. Die voël was nooit siek nie. In 1944 was die Bergkanarie baie oud met groeisels aan die pote en tone (genoem „ boots on ") hoewel hy nog baie mooi gesing het. Hy is toe in Maart 1944 na gevangeskap van 18 jaar en 5 maande dood.

Ongeveer Maart 1947 het ek 'n Geel Dikbeksysie van 'n sekere Dr. Flynn uit London ontvang. Die Dikbeksysie was in 'n hok van ±20 vt. × 10 vt. × 8 vt. gehou.

Die voël was op talle voëlskoue ingeskryf en het vier maal opvolger tot beste S.A. wilde voël gewen, daar dit 'n besondere mooi voël was.

Hy is op rissies, sonneblom, geel „ millet ", manna, gewone geel manna en ingevoerde grassaad gevoer.

I gave the bird to Mr. F. Coetzee of Lyttleton Agricultural Holdings. Here it died in June 1961 as a result of regular fighting with another bird. This Bully Seed-eater spent 14 years and 3 months in captivity.

J. G. HINDLEY,
Nature Conservation Officer.
Pretoria.

A Mischievous Heron

This happened on the morning of August 5th, 1960, while I was busy working on the Vaaldam Nature Reserve.

Die voël was vroeg in 1961, ongeveer Februarie. siek, en is gedokter met terramycin poeier wat oor sy kos gegooi is. Hy is vir die siekte behandel in 'n klein kou van 15 dm. by 12 dm. by 8 dm. en was binne 4 dae gesond.

Die voël was deur my afgestaan aan ene mnr. F. Coetzee van Lyttleton Kleinhoewes en is gedurende Junie 1961 dood deurdat hy en 'n tropiese dikbeksysie mekaar gedurig gebyt het. Die voël was dus 14 jaar en 3 maande in gevangeskap.

J. G. HINDLEY,
Natuurbewaringsbeampte.
Pretoria.

Moedswillige reier

Die voorval het plaasgevind op die môre van 5 Augustus 1960 om ongeveer 8 vm. terwyl ek met opknappingswerk op die Vaaldam Natuurreservaat besig was.

In 'n moerasagtige plek op die reservaat is daar 'n kol riete. In hierdie riete was daar 'n hele paar neste van die goudgeel kaffervink. In vier van hierdie neste was elk twee klein vinkies. Ek het juis die môre van die 5de weer na die voëltjies gaan kyk.

'n Rukkie later het daar 'n geelbek-witreier opgedaag en tussen die riete begin deurstap. Hy het by een van die kaffervink-neste tot stilstand gekom, eers die een en toe die ander kleinvinkie uitgehaal, doodgebyt en op die grond laat val. Daarna het hy na die volgende nes gegaan waar dieselfde proses herhaal is. Toe hy die derde nes nader, het ek hom verwilder want dit was eenvoudig pateties om te sien hoe die ouers van die kleintjies tekere gaan om heirdie groot vyand te verwilder.

C. A. L. BEKKER,
Natuurbewaringsbeampte.
Vereeniging.

Albino oorbietjie

Op my plaas is 'n albino oorbietjieram gebore. Hy het 18 maande oud geword en was heeltemaal spierwit. Ek het sy kop laat opstop en dit is nog in my besit.

C. D. AHLERS,
Boer,
Ermelo Distrik.

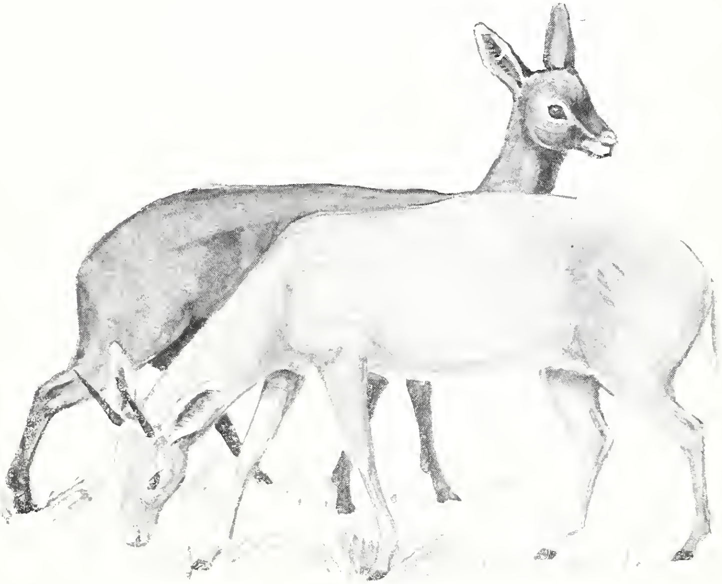
In a swampy part of the reserve there is a patch of reeds where a number of Golden Bishop Birds had their nests. Earlier that same morning I looked and saw that four of the nests each had two young birds.

A little later a Yellow-billed Egret turned up and walked through the patch of reeds. It walked up to a nest, took the young birds out one by one, killed them and dropped them on the ground. Then it proceeded to the next nest where the process was repeated.

As it was approaching the third nest I chased it away because it was simply pathetic to see the parents trying to drive off this big enemy.

C. A. L. BEKKER,
Nature Conservation Officer,
Vereeniging.

Albino Oribi



An albino oribi ram was born on my farm. He lived to the age of 18 months. I had his head mounted and this is still in my possession.

C. D. AHLERS,
Farmer,
Ermelo District.

Is die kameelperd stom?

Dit word algemeen aanvaar dat die kameelperd 'n stom dier is en geen geluid maak nie. Veral in hierdie dae van radio-vasvraprogramme word hierdie gewilde vraag en sy verkeerde antwoord dikwels gehoor.

Kameelperde maak wel geluide en kan 'n groot lawaai opskop as hulle in angs verkeer.

Met die proses van vang en kunsmatige voeding van jong kameelperde kry mens dikwels van hulle wat bulk. Die geluid is baie soos dié van 'n groot beeskalf en is soms baie harder. Die gebulk kom nie by al die kameelperde voor nie; ongeveer 'n kwart van dié wat gevang word, maak hierdie geluid.

Onlangs het hierdie Afdeling drie kameelperde agtereenvolgens gevang wat elk hierdie bulkgeluid geuiter het. Een van die drie het selfs tot drie dae lank elke keer as hy vir voeding hanteer word gebulk.

Of volwasse kameelperde ook hierdie geluid maak, die weet ek nie, want ons het nog nie volwasse kameelperde in die wilde staat hanteer nie.

W. K. KETTLITZ,
Hoofvakkundige Beampte,
Pretoria.

Is the Giraffe Mute?

The giraffe is generally regarded as a mute animal which cannot make a noise. Especially in this age of radio quiz programmes this popular question and its wrong answer is often heard.

The Giraffe can make noises allright and can even kick up a big row when in distress.

In the process of catching and artificial feeding of young giraffe one often comes across individuals that bellow. The noise is rather similar to that of a half-grown ox and sometimes much louder. This bellowing noise was only made by one quarter of the young giraffe that we have caught.

Recently we caught three giraffe in succession, each of which uttered this noise. One of these even bellowed for three days afterwards every time it was handled for feeding.

I don't know whether adult giraffe also make this noise because we have never handled adults in the wild state.

W. K. KETTLITZ,
Chief Professional Officer,
Pretoria.

DASPOORT.